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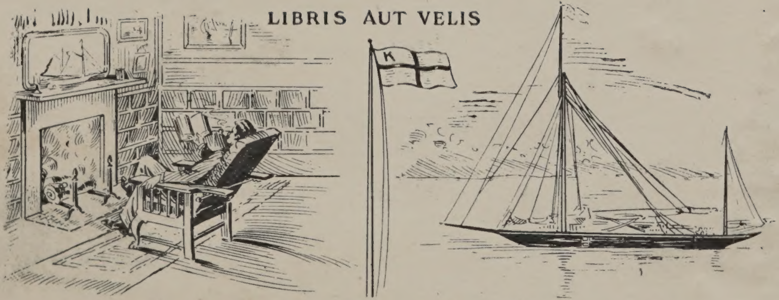

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REED'S

SEAMANSHIP

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REED'S
SEAMANSHIP

COMPILED FOR

CANDIDATES PREPARING TO PASS THE

MARINE BOARD EXAMINATIONS FOR

CERTIFICATES OF COMPETENCY

AS

MATES AND MASTERS

ILLUSTRATED WITH 116 DIAGRAMS

REVISED AND ENLARGED BY C. M. SWAINSTON

NINETEENTH EDITION

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PREFACE TO THE NINETEENTH EDITION.

We believe this Edition to be the only Seamanship illustrated for Board of Trade Examinations.

Figures have been introduced, which it is hoped will assist the beginner in understanding the various questions, and help him to reason for himself other ways in answering several of these questions relating to Seamanship.

It is impossible to give all the various methods, but it is expected that the Candidate, with the illustrations, will have little difficulty in comprehending many of the questions, which from only a printed answer he sometimes fails to understand.

A fuller explanation of the International Code of Signals has been given, and the plates relating to the Distant, Semaphore and Morse Code Signals have been added.

A few slight alterations and additions have been made in the Adjustments of the Sextant, Definitions, Laws of Storms, Deviation Questions, and Master's Business, which we hope will meet the approval of intending Candidates for Examination.

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REED'S SEAMANSHIP

SYLLABUS OF SEAMANSHIP EXAMINATION* FOR ORDINARY CERTIFICATES.

SECOND MATE.

IN SEAMANSHIP.—He must understand and give satisfactory answers on the following subjects :

(*a.*) The standing and running rigging of ships.

(*b.*) Bending, unbending, setting, reefing, taking in, and furling sail.

(*c.*) Sending masts and yards up and down, &c.

(*d.*) Management of a Ship when under canvas.

(*e.*) Management of ships' boats in heavy weather.

(*f.*) Dunnaging and stowing cargo, &c.

(*g.*) The Rule of the Road as regards both steamers and sailing vessels, their regulation lights and fog and sound signals.

(*h.*) The signals of distress, and the signals to be made by ships wanting a pilot, and the liabilities and penalties incurred by the misuse of these signals.

(*i.*) The marking and use of the lead and log lines.

(*j.*) The use and management of the rocket apparatus in the event of a vessel being stranded.

(*k.*) Any questions of a like nature appertaining to the duties of a Second Mate that the Examiner may think necessary to ask.

(*l.*) Also questions on the additional subjects which are specified in the rules of examination for Second Mates' Certificates of Competency for foreign-going steamships.

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* For further information as to Service at Sea and other requirements see " Reed's NEW GUIDE BOOK to the Marine Board Examinations."

ADDITIONAL FOR ONLY AND FIRST MATE.

In addition to the qualifications required for a Second Mate's Certificate, an Only or First Mate will be required to show a knowledge of the following subjects:—

(*a.*) Shifting large spars, rigging sheers, taking lower masts in and out.

(*b.*) How to moor and unmoor ship; to keep a clear anchor; and to carry out an anchor.

(*c.*) How to manage a ship in stormy weather, and to cast a ship on a lee shore.

(*d.*) How to secure the masts in the event of accident to the bowsprit.

(*e.*) How to rig purchases for getting heavy weights, anchors, machinery, &c., in or out.

(*f.*) How to dispose various kinds of cargo and weights in a stiff, and in a tender vessel.

(*g.*) The ventilation of holds, and the stowage of explosives.

(*h.*) How to rig a sea anchor, and what means to employ to keep a vessel, disabled or unmanageable, out of the trough of the sea, and lessen her lee drift.

(*i.*) How to get a cast of the deep sea lead in heavy weather.

(*j.*) Accidents, and how to deal with them.

(*k.*) Any other questions appertaining to the duties of an Only or First Mate which the Examiner may think necessary to ask.

(*l.*) Also questions on the additional subjects which are specified in the rules of examination for Only and First Mate's Certificates of Competency for foreign-going steamships.

ADDITIONAL FOR MASTER.

In addition to the qualifications required for the grades of Second and First Mate, an Ordinary Master will be required to show a knowledge of the following subjects:—

(*a.*) Construction of jury rudders for both wooden and iron vessels, also rafts.

(*b.*) Resources for the preservation of the ship's crew in the event of wreck.

(*c.*) Management of ship in heavy weather.

(*d.*) Rescuing the crew of a disabled vessel.

(*e.*) Steps to be taken when a ship is on her beam ends, or in any danger or difficulty, or disabled or unmanageable and on a lee shore.

(*f.*) Heaving a keel out.

(*g.*) How to proceed when placing a ship in dry dock, and in directing repairs, and when putting into port in distress with damage to cargo and ship.

(*h.*) Any other questions of a like nature appertaining to the management of a ship which the Examiner may think it necessary to ask.

(*i.*) Also questions on the additional subjects which are specified in the rules of examination for Master's Certificate of Competency for foreign-going steamships.

ADDITIONAL FOR EXTRA MASTERS.

In addition to the qualifications required for an Ordinary Master, an Extra Master will be expected to give satisfactory answers to any questions in practical seamanship that the Examiner may put to him.

SYLLABUS OF SEAMANSHIP EXAMINATION FOR OFFICERS IN *STEAMSHIPS* ONLY.

SECOND MATE.

In Steamship, &c.—The Candidate must understand and be able to give satisfactory answers on the following subjects :—

(*a.*) The standing and running rigging of steamships.

(b.) Bending, unbending, setting, reefing, taking in, and furling sail.

(*c.*) Sending masts and yards up and down, &c.

(*d.*) Seeing everything in readiness and clear for getting under weigh, and the precautions to be then observed with regard to engines, propeller, &c.

(*e.*) Management of a steamship when under canvas.

(*f.*) Management of a ship's boat in heavy weather.

(*g.*) Dunnaging and stowing cargo, &c.

(*h.*) The Rule of the Road as regards both steamers and sailing vessels, their regulation lights and fog and sound signals.

(*i.*) Signals of distress, and signals to be made by ships wanting a pilot, and the liabilities and penalties incurred by the misuse of these signals.

(*j.*) The marking and use of the lead and log lines.

(*k.*) The construction, use, and action of the sluices, and of the water-ballast tanks.

(*l.*) Engine-room telegraph, &c.

(*m.*) Use and management of the rocket apparatus in the event of a vessel being stranded.

(*n.*) Any other questions of a like nature appertaining to the duties of the Second Mate of a steamship which the Examiner may think necessary to ask.

ADDITIONAL FOR ONLY AND FIRST MATE.

In addition to the qualifications required for a Second Mate's Certificate, an Only or First Mate will be required to show a knowledge of the following subjects :—

(*a.*) Shifting large spars ; rigging sheers ; and taking lower masts in and out.

(*b.*) How to moor and unmoor ship ; keep a clear anchor ; and to carry out an anchor.

(*c.*) Management of a steamship in stormy weather.

(*d.*) How to rig purchases for getting heavy weights, anchors, machinery, &c., in and out.

(*e.*) How to dispose various kinds of cargo and weights in a stiff, and in a tender vessel.

(*f.*) Ventilation of holds, and the stowage of explosives.

(*g.*) The effects of the screw race upon the rudder ; and the effect produced on the direction of the head of the ship by going [ahead] [astern] with a [right] [left] handed screw when the rudder is [ported] [starboarded] ; also, the effect of twin screws under the same conditions, and when going ahead with one and reversing the other, &c., &c.

(*h.*) How to rig a sea anchor, and what means to employ to keep a steamer, with her machinery disabled, out of the trough of the sea, and to lessen her lee drift.

(*i.*) How to turn a steamship short round.

(*j.*) How to get a cast of the deep sea lead in heavy weather.

(*k.*) Any other questions of a like nature appertaining to the duties of a First Mate of a steamship which the Examiner may think it necessary to put to him.

ADDITIONAL FOR MASTER.

In addition to the qualifications required for the grades of Second and First Mate, a Master will be required to show a knowledge of the following subjects :—

(*a.*) Construction of rafts and jury rudders suitable for screw steamships.

(*b.*) The preservation of the ship's crew in the event of wreck.

(*c.*) Management of steamships in heavy weather.

(*d.*) Rescuing the crew of a disabled ship.

(*e.*) Steps to be taken when a vessel is on her beam ends, or disabled and on a lee shore.

(*f.*) How to use steam appliances in the event of fire.

(*g.*) The best arrangement for towing vessels under different circumstances.

(*h.*) Placing ship in dry dock ; directing repairs ; and the mode of procedure when putting into port in distress wiih damage to cargo and ship.

(*i.*) Any other questions of a like nature, appertaining to the management of a steamship which the Examiner may think it necessary to put to him.

ADDITIONAL FOR EXTRA MASTER.

In addition to the qualifications required of a Master of a foreign-going steamship, the Extra Master will be expected to give satisfactory answers to any questions appertaining to the management of a steamship that the Examiner may put to him.

SEAMANSHIP REQUIRED FOR SECOND MATE.

Miscellaneous Questions.

1. You are appointed to a ship ready to take in cargo, what is the first thing you would do on going on board ?

Report myself and ask for orders.

2. And then, if no special orders were given you ?

Go into the hold, see that the limbers were clear, the hold well swept, dunnage properly laid, and the pumps all right.

3. And then ?

Take an account of everything that would be under my charge. Make myself acquainted with the working of the windlass, steering gear, winches, &c.

4. If your ship were ready to proceed to sea, what would you see to ?

That the hatches were battened, and everything securely lashed ; that the wheel-chains were clear, and their ends properly secured ; see that no nails or other iron is near the binnacles, and see that the lead and log lines are properly marked, and put them away myself, so that I should know where to lay my hand upon them at a moment's notice. Have the towline and other warps and lines ready ; see that all necessary gear is bent and rove.

5. You are in charge of the deck, coming on dark, ship labouring a good deal, what would you do before darkness set in ?

See all running gear coiled up and hung on the pins, halliards overhauled ready to let go, everything secured about the decks, battens and tarpaulins secure on the hatches, and that there is no chafe on the mast coats.

6. Discharging cargo. Supposing you found only the hoops and staves of a cask in the hold ; what would you do with them ?

Be sure and let them stay where they are, until the captain has seen them.

7. Relieving watch at night, what would you do?

See that all the lights are burning bright, the man on look-out is keeping a proper look-out, the man at the wheel is steering the right course, keep a good look-out myself, and pay particular attention to any orders that may be left.

8. What guide have you got coming up the English Channel in a fog?

Lead and compass.

9. Coming along the land, what is the first thing you would do, seeing a fog coming on?

Take a bearing of any point or lighthouse in sight, also a cast of the lead, call the master, ease the ship down and keep a good look-out. In a steamship keep the whistle going, and in a sailing ship keep the fog-horn going.

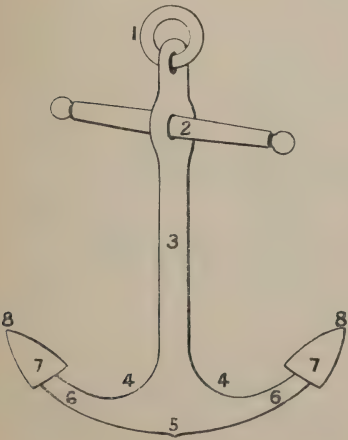
10. What would you do after a gale?

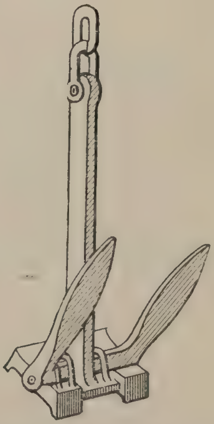
Examine everything aloft and on deck and if any damage, repair at once.

11. Name the different parts of an anchor?

1 Ring, 2 stock, 3 shank, 4 trend, 5 crown, 6 arm, 7 fluke and palm (flat part), 8 pea.

Fig. 1.





STOCKLESS ANCHOR.

12. You had to call the master, would you call him yourself ?

No. I should send someone to call him.

13. Where would you make a buoy-rope fast ?

Round the crown of the anchor.

14. Lying with two anchors out, which one would you pick up first ?

Lee one ; that is, the one I am not riding by.

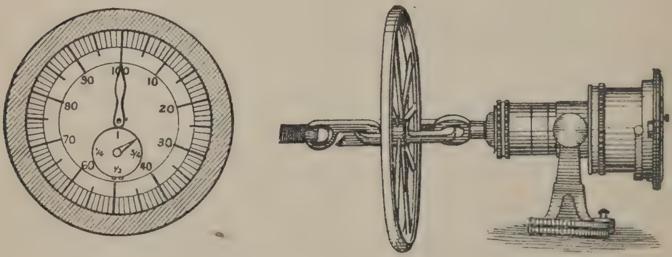
15. How would you carry out a kedge ?

Place a plank across the quarters of the boat, and lay the flukes of the kedge on this plank, so that the stock is over the stern of the boat a little to one side of the notch. When nearly out to the place, cast the buoy astream ; when quite out, pay out sufficient warp to let the kedge reach the bottom, take hold of the plank, and so cant the kedge overboard. If the kedge is too heavy, hang it to the ring over the stern, and if too heavy to hang, get a line on to one of the flukes and haul the crown and flukes under the bottom of the boat.

16. How would you set a patent log ?

All the pointers at zero ; and always turn them forward, never backward.

Fig. 2.



DIAL AND TAFFRAIL PATENT LOG.

17. Man overboard, what would you do ?

Bring the ship to the wind, and throw a lifebuoy, or anything that will float him, overboard ; send a hand aloft to watch him, and lower the boat.

18. How many seconds in an hour ? 3600.
19. How many feet in a nautical mile ? 6080.
20. How many feet in a statute mile ? 5280.
21. How many fathoms in a cable ? 100.
22. How many cables in a mile ? 10.
23. How many fathoms in a ship's cable ? 120.
24. How many square inches in a square foot ? 144.
25. How many cubic inches in a cubic foot ? 1728.
26. How many pounds in a hundredweight ? 112.
27. How many hundredweights in a ton ? 20.
28. How many pounds in a ton ? 2240.
29. How many gallons in a barrel ? 36.
30. How many gallons in a hogshead ?
54. (Barrel & a half.)

31. How many gallons in a puncheon ?
72. (Two barrels.)

32. How many gallons in a pipe or butt ?
108. (Three barrels.)
(The above gallons relate to ale and beer.)

33. How many gallons in a bushel ? 8.

34. How many bushels in a quarter ? 8.

35. What is the advantage in the additional mast-head light that steamships underway may carry ?

The direction of the ship's head can be ascertained without seeing the side lights.

36. What would you be careful about when taking a sailing ship out from between a tier of ships ?

See the yards and braces clear, so as not to foul the gear of the ships on either side.

37. How would you run a rope away to windward ?

Coil the rope in the boat, row to windward make the rope fast and pay out as the wind blows the boat back to the ship.

38. There is an over hand knot in the rope (previous question), how would you get it out?

Overhaul the knot and reeve the boat through.

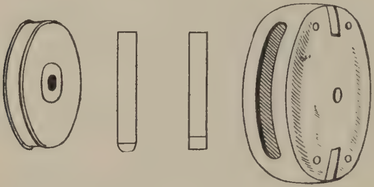
39. There is not sufficient rope to reach the ship?

Buoy the end of the rope with an oar, and go back to the ship for another rope to bend to it.

40. Name the different parts of a block?

Shell, pin, sheave, bush, score, strop, and swallow.

Fig. 3.



SHEAVE, PINS, AND SHELL.

41. How would you reeve a watch tackle?

Reeve through the double block, then through the single, through the double again and make fast to the single.

42. What is the length of a transport line?

90 to 120 fathoms.

43. How would you make a square sail up to stow away in the locker?

Stretch the sail out, rope to the deck, make it up on the foot or head, and tie the stops.

44. How would you make a fore and aft sail up to stow away in the locker?

Stretch the sail out, rope to the deck, and make it up on the after leach.

45. Where ought you to be when loading grain in bulk?

In the hold seeing that the grain is properly trimmed, and no spaces left under the deck.

46. How would you beach a boat in a surf?

Keep her head on, row and meet every sea, back in when they pass; just as the boat is touching the beach throw her broadside on.

47. What do you mean by boxing the compass?

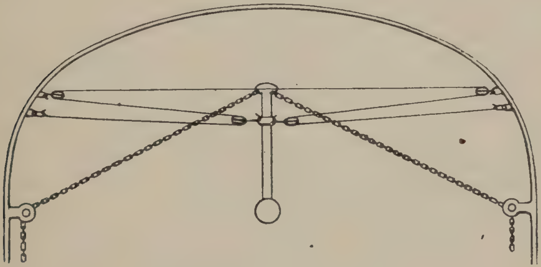
To name the points of the compass in their proper order.

48. How do you reeve relieving tackles?

Four single blocks; one at each side of the ship, and one each side of the tiller. Make one end of the fall fast at one side, (say the port side) and reeve the other end through the block on the tiller, then through the block on the side (port side), then right across the deck and through the block on the other side (starboard side), through the remaining block on the tiller and haul well tight, making fast to the starboard side; or both sides could be rove together making one end fast and tightening on the other.

In a large ship two double blocks, and two single blocks are generally used.

Fig. 4.



RELIEVING TACKLE.

49. How would you reeve from a long coil?

The reverse way to question 48.

50. How would you take in cable chain from a lighter?

Place the lighter under the bow and heave with the windlass the chain through the hawse pipe, making sure that the square ends of the shackles come in first.

51. Why the square ends first?

So that, when the anchor is let go, the round end of the shackles are not likely to catch and be stopped by any obstructions round the windlass or hawsepipe.

52. How do you know when a man-of-war wants to signal to you?

She will have the code pennant hoisted under her ensign.

53. Which end will you pass a drift net fisherman?

The opposite end to which she is hanging to her nets. During the night the end where the flare is shown.

54. Approaching the land in fog, when would you take a cast of the lead?

Directly the fog comes on. I should also ease the ship down, call the master, and keep the whistle or fog horn going; a good look-out will have to be kept.

55. Which side do you find the bolt rope on square and fore and aft sails?

Rope aft for square sails, and on the port side for fore and aft.

56. How are bolt ropes fastened to sails?

Hemp ropes sewn to the canvas and wire ropes marled.

57. How many anchors are ships of 1000 tons, 2000 tons and 3000 tons required to carry?

Three bowers, one stream and two kedges.

58. What are the weights of these anchors?

Registered Tons		Bower. Cwts.		Stream. Cwts.		Kedge. Cwts.
1000	...	23	...	8	...	4
2000	...	33	...	10½	...	5½
3000	...	40	...	12	...	6

TABLES—WEIGHTS AND MEASURES.

AVOIRDUPOIS.

For all Common Goods.

16 Drams	make	1 Ounce (*oz*)
16 Ounces	. .	1 Pound (*lb*)
14 Pounds	. .	1 Stone
28 Pounds	. .	1 Quarter
4 Quarters (112 lbs.)		1 Hundredweigt (*cwt*)
20 Hundredweight	.	1 Ton (2240 lbs)

TROY.

For Gold, Silver, and Jewellery, and in Philosophical Experiments.

24 Grains	make	1 Pennyweight (*dwt*)
20 Pennyweights	.	1 Ounce
12 Ounces	. .	1 Pound

The lb. Av. contains 7,000 *grs. Troy.*

APOTHECARIES.

For mixing and preparing Medical Prescriptions.

20 Grains	make	1 Scruple
3 Scruples	. .	1 Dram
8 Drams .	. .	1 Ounce
12 Ounces.	. .	1 Pound

The gr. oz. and lb. are the same as in Troy Weight.

LENGTH.

4 Inches	make	1 Hand	
12 Inches .	. .	1 Foot	
3 Feet	. . .	1 Yard	
6 Feet	. . .	1 Fathom	
5½ Yards .	. .	1 Rod, Pole, or Perch	
40 Poles (220 yds.)	.	1 Furlong	
8 Furlongs (1760 yds)		1 Mile (5280 ft.)	
3 Miles	. . .	1 League	
2¼ Inches.	. .	1 Nail	*Cloth M.*
4 Nails	. . .	1 Quarter	
4 Quarters	. .	1 Yard	
5 Quarters	. .	1 Ell	
100 Fathoms	. .	1 Cable	
10 Cables	. .	1 Mile	
120 Fathoms	. .	Length of ships cable	

SURFACE.

144 Square Inches	make	1 Square Foot
9 Square Feet	. .	1 Square Yard
30¼ Square Yards	. .	1 Sq. Rod, Pole, or Perch (*P*)
40 Perches	. . .	1 Rood (*R*)
4 Roods (4840 sq. yds.)		1 Acre (*A*)
640 Acres .	. . .	1 Square Mile

SOLIDITY.

1728 Cubic Inches	make	1 Cubic Foot
27 Cubic Feet	. .	1 Cubic Yard

CAPACITY.

4 Gills	make	1 Pint	
2 Pints .	. . .	1 Quart	
2 Quarts .	. . .	1 Pottle	
4 Quarts .	. . .	1 Gallon	
2 Gallons.	. . .	1 Peck	
4 Pecks .	. . .	1 Bushel	
8 Bushels	. . .	1 Quarter	
5 Quarters	. . .	1 Load	
3 Bushels	. . .	1 Sack	*Coal Meas.*
12 Sacks .	. . .	1 Chaldron	
A Barrel of *Beer*	contains	36 Gallons	
A Hogshead	. .	54 Gallons	
A Hogshead of *Wine*	.	63 Gallons	
A Puncheon .	. .	2 Barrels	
A Pipe or Butt	. .	2 Hogsheads	

TIME.

60 Seconds	make	1 Minute
60 Minutes.	. .	1 Hour
24 Hours .	. .	1 Day
7 Days .	. .	1 Week
4 Weeks .	. .	1 Lunar Month
365 Days .	. .	1 Year

Since 52 Weeks, or 13 Lunar Months, contain 364 Days, these are often reckoned as a Year.

The Year is also divided into 12 Months, called *Calendar Months*, which contain unequal numbers of Days—

January . .	31	May	31	September .	30
February . .	28	June	30	October . .	31
March . . .	31	July , . . .	31	November .	30
April . . .	30	August . . .	31	December .	31

Of these all contain 31 Days, except February, which has 28, and those mentioned in the following rhymes, which have 30 :

Thirty days have September,
April, June, and November.

Every Fourth Year contains 366 Days, and is called Leap-Year ; and in such a year February has 29 Days.

LOG LINE AND GLASS.

1. What is the use of the Log Line ?

To determine the rate of the ship's sailing.

2. What instrument is always used with the ordinary log ?

A sand glass.

3. How do you find the length of a knot corresponding to a glass which runs a certain number of seconds ?

As the seconds in one hour (3600) are to the seconds in a glass, so are the number of feet in a nautical mile (6080) to the number of feet to a knot.

4. What are the *correct* lengths of a knot for a twenty-eight seconds glass and a thirty seconds glass ?

Forty-seven feet three and a half inches, and fifty feet eight inches.

5. Work it out for a 28 second glass ?

```
        sec.      sec.       feet.
As      3600  :   28   : :   6080   :  a knot.
                               28
                             ----
                            48640
                           12160
                           ------
                    3600)170240(47 feet
                          14400
                          ------
                           26240
                           25200
                           -----
                            1040
                              12
                           -----
                     3600)12480(3½ inches
                           10800
                           -----
                            1680
                            ----
```

6. Would you measure the Log Line to this full length, or more, or less ?

About 8 or 9 inches less.

7. Why?

So that the ship should not over-run her reckoning.

8. What length would you mark the Log Line then?

For a 28 second glass it would be 46 feet 8 inches, and for a 30 second glass 50 feet.

9. What is the rule for this; called usually the short rule?

To the seconds the glass runs affix a cipher and divide by 6, the quotient is the feet; and if there is a remainder, multiply it by 2 for inches.

10. Work out this for a 28 second glass?

Attach a cipher and it becomes 280

6)280
feet 46—4
2
8 inches. Answer, 46 feet 8 inches.

11. Supposing that your Log Line is marked to 46 feet 8 inches, but your glass runs out in 14 seconds; what would you do?

I should double the number of knots run out.

12. If all your glasses should be broken during the voyage?

Use a watch with seconds hand, or a chronometer.

13. What stray line would you allow?

From twelve to fifteen fathoms.

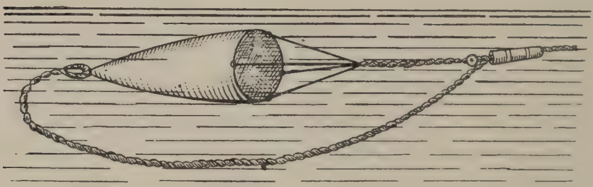
14. How would you mark a Log Line?

After the line was thoroughly stretched, I would mark off the stray line and put a piece white rag; then mark off the length of the knot and put a piece of leather; at the next knot a piece of cord with two knots, &c.; between the knots I would put a piece of cord with one knot to indicate the half knots.

15. How would you heave the Log?

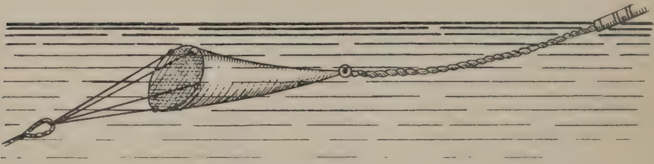
Three hands are required, viz.:—Officer of the watch, and two seamen or apprentices. One seaman holds the log reel, the other the sand glass; the officer takes the Log Bag and places the wooden peg in the wooden socket on the line. All three take up their positions on the lee quarter, and the officer draws a few feet of line from the reel, and drops the bag over the stern into the sea; the line begins to run from the reel through the officer's hands, and directly the white rag comes to his hands he calls out *turn* to the man with the glass, who obeys on the instant; the line is now running off the reel at the same rate the ship is sailing, and the sand is running in the glass; the instant the sand runs out of the glass, the man holding it calls *stop*, and the officer immediately stops the line from running further; he looks to see which knots are near his hands, and ascertains the rate the ship is sailing. The line is then jerked to release the peg, the bag capsizes and is hauled in over the surface of the sea.

Fig. 5.



HEAVING LOG.

Fig. 6.



HAULING IN.

PATENT LOGS.

There are various kinds which are now in general use. Some fix on the rail, others tow in the water; they all have dials which indicate the distance run (see Fig. No. 2).

LOG REEL, LOG GLASS & LOG SHIPS.

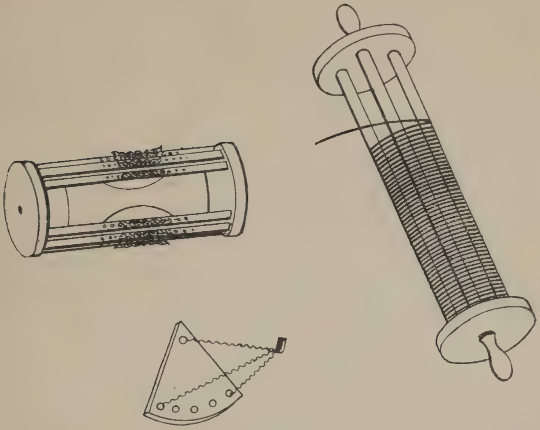


Fig. 7.

LEAD LINE.

16. How would you mark the Hand Lead Line ?

At 2	fathoms	Leather, with two tails
3	,,	Leather, with three tails
5	,,	White rag
7	,,	Red rag
10	,,	Leather, with a hole in it
13	,,	Blue rag
15	,,	White rag
17	,,	Red rag
20	,,	Piece of cord with two knots in it.

There are nine marks and eleven deeps on the Hand Lead Line ; the above are the marks, 1, 4, 6, 8, 9, 11, 12, 14, 16, 18 and 19 fathoms being deeps.

17. How do you mark the Deep-Sea Line ?

The same as the Hand Line as far as the 20 fathoms, then for every additional 10 fathoms add a knot to the cord, and at every 5 fathoms a piece of cord with one knot only, or a piece of leather, which is better.

18. On a dark winter's night, with your hands so benumbed with cold that you cannot tell the marks by your touch, what would you do?

Put it to my lips. If the white be a bit of canvas, the red a bit of bunting, and the blue a bit of cloth, the lips will instantly tell the difference.

19. How do you heave the Hand Lead?

The leadsman takes up a position on the side of the ship and holding a small coil in one hand and the lead hanging from the other, he swings the lead backwards and forwards two or three times and when on the forward swing he lets go; the lead shoots well ahead and the leadsman knows instantly when he finds bottom. He calls out the soundings;—"by the mark 5," "by the deep 8," "a quarter less 6," &c.

20. How do you heave the Deep Sea Lead?

Arm the lead and pass it along the weather side clear of all obstructions as far as the forecastle head. Station a few hands at intervals on the side with small coils of the line in their hands. Get the way off the ship by luffing in a sailing ship and easing the engines in a steamship, When ready give the order to *heave*; the hand on the forecastle heaves and calls out "Watch there Watch", the others stationed on the side with the small coils do likewise one after the other. The officer who is stationed aft, feels the lead on the bottom as the ship passes and notes the mark on the surface of the water.

21. What do you mean by "Arming" or "Priming" the lead?

Filling the hollow at the bottom of the lead with tallow, so that when the lead is hauled up, the nature of the sea bottom will be secured and shown on the tallow.

22. What is the weight of the hand lead?
From 7 to 14 lbs.

23. What is the weight of the deep sea lead?
28 lbs.

PATENT LEAD OR SOUNDING MACHINE.

There are various kinds, the principle of which are all the same, viz.—The water pressure has the effect of indicating the depth in fathoms on the instrument itself; some have small glass tubes with a coloured liquid which is forced up the tube by the pressure, and is then measured on a scale which gives the depth.

The instrument fits into a protecting case which is secured to a very fine steel wire. A sinker is also made fast to the end of the wire ; the sinker can be armed the same as the ordinary lead. The wire is reeled round the barrel of a special winch for lowering and heaving in ; the winch generally has a line measurer which indicates the line run out, and is also fitted with a brake for controlling the speed.

How do you take a cast with a Patent Lead ?

Make fast the sinker (armed) and instrument to the wire, see the winch ready, put the wire in the fairlead and lower away over the quarter, regulating the speed with the winch. When the sinker finds bottom heave away on the winch, the arming on the sinker will show the nature of the sea bottom and the instrument the depth in fathoms.

NOTE.—The length of line run out has nothing to do with the depth.

PATENT LEAD.

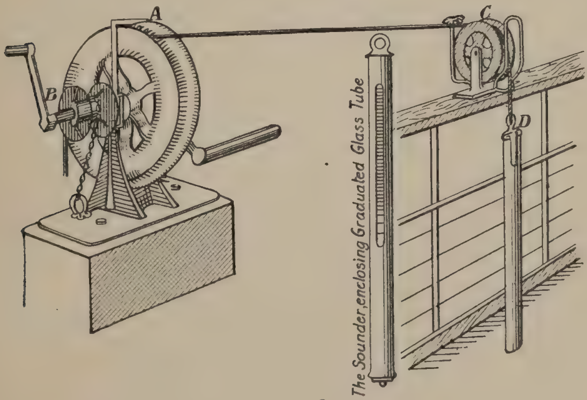


Fig. 8.

STOWAGE OF CARGOES.

1. What is dunnage ?

Loose wood or other substances laid at the bottom of a ship.

2. What is it for?

To prevent damage to the cargo if the ship should leak.

3. What part would you dunnage?

The floors, bilges, pump-well, masts, and in the wake of the chain plates, scuppers, hooks, and transoms.

4. What dunnage would you allow for a general cargo?

9 inches on the floors to 14 on the upper part of the bilges, and 2½ inches in the sides.

5. Suppose the cargo were bale goods?

9 inches on the floors and to the upper parts of the bilges, and 2½ at the side. The wing bales of the second tier to be kept 6 inches off the sides of the lower corner.

6. Bags of coffee or cocoa?

9 inches on floors, 14 to upper parts of bilges, and 2½ at the sides.

7. Guano?

Two to three feet. Over the dunnage a tier of bags fore and aft, and, if possible, a second tier so laid as to cover the cantlines of the first; and bags to be built up the sides, around the mast casings, &c.

8. How do you stow bar or railway iron?

Fore and aft till level with the keelson, then grating fashion.

9. How would you protect the sides of your ship?

By laying bars fore and aft along the sides.

10. How do you secure it?

By laying the last three tiers solid, and shoring, lashing, and wedging the lot well down.

11. How do you stow bale goods?

On their flats amidships, marks and numbers up, on their edges in the wings, marks and numbers inboard.

12. Why would you stow the wing bales on their edges?

So that in the case of leakage only that part of the bale next the side of the ship would be damaged.

13. How would you stow cases?

Marks and numbers up.

14. How would you stow a general cargo?

Marks and numbers up.

15. Where would you stow oil, resin, pitch, tar, &c.?
In the fore peak.

16. Where carboys of acids?
On deck.

17. Why?
Ready to throw overboard if there is risk of breakage.

18. How do you stow casks?
Fore and aft. Bung up and bilge free, good cross beds at the quarters, and well chocked with wood.

19. How could you find the bung of a dirty cask?
The rivets of the hoops are in a line with the bung.

20. Why are casks stood bung up?
To prevent leak, and because it is the strongest way of the casks; the head-pieces are put in so that they are up and down when the cask is bung up.

21. How many heights are you allowed to stow?
3 of pipes or butts, 4 of puncheons, 6 of hogsheads, and 8 of barrels.

22. How would you stow a single cask?
With 3 inches of soft wood bed under each quarter and quoins on the beds on each side.

23. If stowing a cargo of casks, how would you stow the ground tier?
Bilge and bilge. (See *b*, Fig. 9.)

24. The first upper tier?
In the cantlines (*a*) of the ground tiers, with quoins under the quarters at each side.

NOTE.—When stowing wines, a platform should be laid over every tier.

25. Where would you stow valuable goods?
Near the officers' berths and away from the crew.

26. To what depth should a ship be loaded?
So as to have, when upright, about 3 inches of clear side out of water for every foot depth of hold.

27. In stowing baulks of timber, what should you be careful about?
To see that the ends and sides are well chocked off.

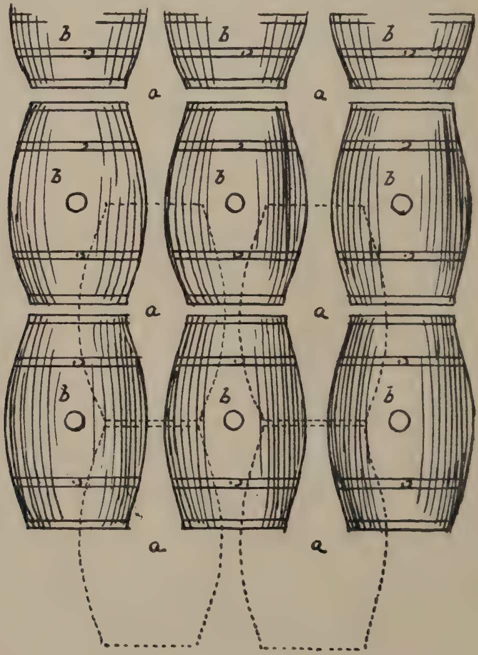
28. How do you secure this cargo when all in ?
With tom shores under the beams.

29. What dunnage do you allow for grain ?
Not less than 10 inches on the floors and 14 in the bilges, and the hold to be matted.

30. How would you lay the mats ?
Begin in the midships both on floor and sides, and work forward and aft, and overlap about one-third.

31. Describe how you would take a chest of gold in ?
I would make a rope net bag, each part of the rope being capable of holding the weight of the chest. Take in the chest in this bag, with a line also attached to the chest. The bag must have a buoy and a buoy line.

Fig. 9.



STOWING CASKS.

32. Prepare a hold for dry cargo ?

The hold must be thoroughly swept, well aired, dried, dunnaged and matted; double mats where the ship is liable to strain, and see that the limbers are clear.

33. How do you lay dunnage ?

Athwartship underneath and fore and aft on top.

34. Why athwartship underneath ?

To allow a free water course when the ship is rolling, should the water get above the ceiling.

35. How do you tell when casks are bilge free ?

By feeling with the hand.

36. Where do you stow gunpowder ?

In a properly constructed magazine near the hatchway.

TENDING SHIP IN A TIDE WAY.

1. What do you mean by lee tide ?

Wind and tide in the same direction.

2. What do you mean by weather tide ?

Wind and tide in opposite directions.

3. What position would a ship take in a case of lee tide if she were left alone with the helm amidships ?

She would sheer about with the anchor first on one bow then on the other.

4. What would you do to keep her steady ?

Give her a slight sheer with the helm.

5. Wind and tide right ahead (lee tide) how would you sheer your ship ?

Either to port or starboard, with the anchor about a point on the bow.

6. How would you trim the yards ?

Brace the fore yards aback and point the main.

7. Why the fore yards aback ?

To help to keep the sheer.

8. Suppose the wind was very strong ?

Point all the yards.

9. If there should be a shoal on either side of you, how would you sheer the ship ?

Towards the shoal.

10. Why ?

Because if she broke her sheer, she would go from the danger.

11. You want to get ready for the weather tide, what would you do ?

Give the ship a broader sheer with the helm, and hoist the foretopmast staysail (sheet to windward) before the tide is done.

12. Why would you hoist the fore topmast staysail ?

To help to keep the sheer during slack water when the helm is of no use.

13. Is there anything else will help to keep the sheer ?

Yes. The fore yards which are already aback will help to keep the sheer.

14. What will occur after slack water ?

The tide will begin to make in the opposite direction to the lee tide which will be the weather tide now.

15. What effect will it have on the ship ?

The tide catching the ship under the quarter with the help of the wind on the other bow, will swing the ship athwart the wind and tide. Fill on all the yards, and shift the staysail sheet to leeward, the ship will now forge ahead and tighten the cable, and the tide on the lee beam will swing the ship over the cable ; steady her with the helm. The ship will now take up a position with the anchor on her lee quarter and the tide a little on her lee bow, which is the position the ship will lay during the weather tide, so long as the wind remains stronger than the tide.

16. How will you trim the yards ?

Brace the main yards by and point the fore, if the wind be strong ; but if the wind be light, keep the yards square.

17. Suppose the ship remains in her proper position during the weather tide, what will she do when the tide is finished ?

Turn round head to wind and be ready for the lee tide.

18. Suppose during the weather tide the wind falls light, and the tide becomes stronger than the wind, what will the ship do ?

Drop astern, and be tide rode to windward of the anchor.

19. What would be the safest thing to do in the above case at slack water ?

Heave short, then pay your cable out again when the ship is on the lee side of the anchor.

Note.—In a case of weather tide always sheer the ship with the anchor on the lee quarter.

WIND ACROSS THE TIDE.

20. How will you sheer a ship wind across the tide ?

To leeward, with everything aback ; tide a little on the weather bow, anchor about six points on the weather bow.

21. How long would the ship lie in this position ?

Until slack water.

22. What would she do at slack water ?

Swing head to wind.

23. What would you do ?

Turn the yards round.

24. How long will the ship remain head to wind ?

Until the next tide catching her on the broad side, swings her round with the wind on the other side, she will lie again in a similar position as before, with the anchor about six points on the weather bow and the tide a little on the weather bow.

Note.—Loaded ships as a rule will lie best to windward of their anchor.

SHORT RULES FOR SINGLE ANCHOR.

Lee Tide.

Ship with a slight sheer, anchor, wind and tide a little on the bow.

Weather Tide.

Ship with a sheer, anchor on lee quarter, tide a little on lee bow.

Wind across Tide.

Ship to leeward with everything aback; anchor about six points on weather bow, and tide a little on same bow.

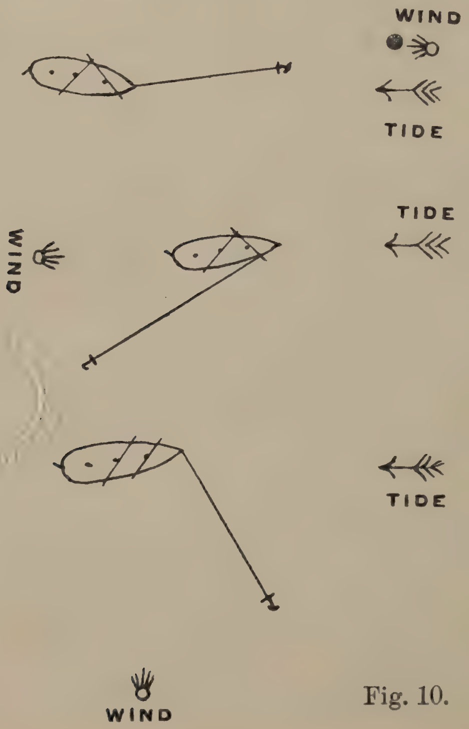


Fig. 10.

STEAMSHIPS AND SHIPS CROSSING.

Diagrams showing three Different Positions of a Light Crossing.

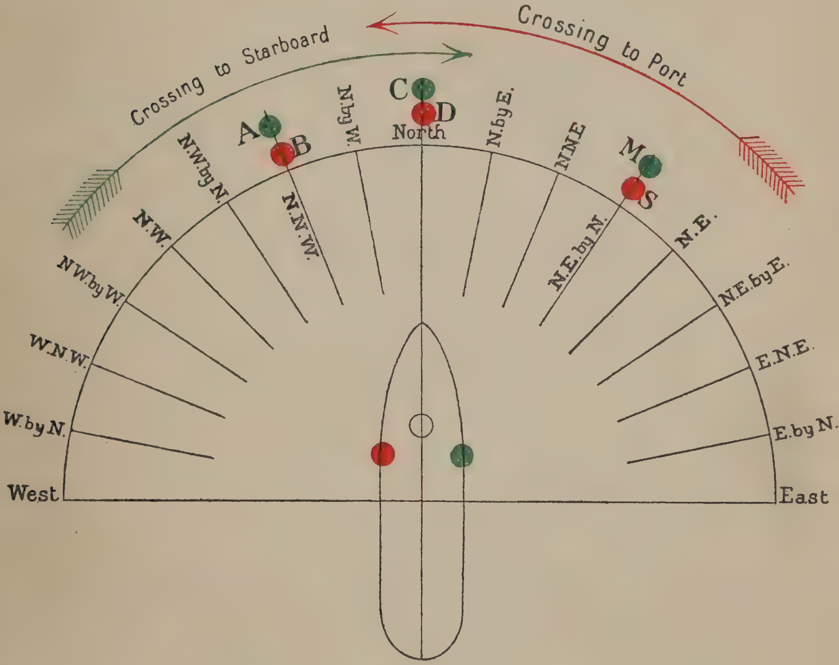


Fig. 11.

Light A.—Going to Cross.
Light B.—Has Crossed.
Light C.—Is Crossing.
Light D.—Is Crossing.
Light M.—Has Crossed.
Light S.—Going to Oross

Allow 6 points to the *Right* of the Bearing and the opposite point to the bearing for a *Green* light, and 6 points to the *Left* of the bearing and the opposite point to the bearing for a *Red* light, to ascertain the direction in which any ship can be going.

RULE OF THE ROAD.

1. You see a ship's side light, can you tell on the instant how she is going ?

Not the particular course she was steering; but I could tell within ten points.

2. What is the rule to find the ten points a ship is going between for you to see the light ?

Six points to the right of the bearing for a green light, and the opposite point to the bearing, and six points to the left of the bearing, and the opposite to the bearing for a red light.

3. A steamship's red light is bearing North, how would she be steering ?

Between WNW and South nearly.

4. NNE ?

Between NW and SSW nearly.

5. NE ?

Between NNW and SW nearly.

6. ENE ?

Between North and WSW nearly.

7. A steamship's green light bears North, how would she be steering ?

Between ENE and South nearly.

8. NNW ?

Between NE and SSE nearly.

9. NW ?

Between NNE and SE nearly.

10. WNW ?

Between North and ESE nearly.

11. Why do you say nearly ?

Because a ship would show both side lights when she was steering on the opposite point to the bearing.

12. Will this rule apply to sailing ships ?

Yes, but allowance will have to be made for the wind, as a sailing ship will only lay six points from the wind when she is close hauled.

13. Wind North, sailing ship's red light bears South, how is she steering ?

Between ESE and ENE. Six points to the left of

South is ESE, and opposite point to South is North. A sailing ship could not lay on all points between ESE and North with a northerly wind, as six points from North is ENE, hence ESE to ENE.

14. Wind North, sailing ship's red light bears SW ?
SSE to ENE.

15. Wind North, sailing ship's red light bears WSW ?
South to ENE. In this example she can sail on all the points and show the light.

16. Wind North, green light bears South ?
WSW to WNW.

17. Wind North, green light bears SE ?
SSW to WNW.

18. Wind North, green light bears ESE ?
South to WNW. In this example she can sail on all the points and show the light.

19. Wind South, green light bears North ?
ENE to ESE.

20. Wind South, red light bears NE ?
NNW to WSW.

RULE OF THE ROAD.

STEAMSHIPS.

Red light on Starboard side.

Keep clear of all red lights on starboard side. (Art. 19.)

If two or three points on the bow, alter your course to starboard.

If five or six points on the bow, take a bearing and watch how it alters; if the light is closing slowly and keeping on the same bearing, slacken speed, and let the light pass ahead; if the light is closing in and slowly drawing astern, alter your course to port and keep your speed; if the light is closing in and slowly drawing ahead, slacken speed, and let the light pass ahead.

Green light on Port side.

Stand on for all green lights on port side (Art. 21.) The green lights have to keep clear (Art. 19); if the green light is so close that collision cannot be avoided by the action of the giving-way vessel, you will also have to take such action as will best aid to avert collision. (Note, Art. 21 also Arts. 27 and 29).

End on.

All three lights ahead, each alters course to starboard. (Art. 18.)

Three lights on Starboard Bow.

When all three lights are seen on starboard bow, keep clear (Art. 19); the ship showing the three lights stands on (Art. 21.) This is not a case where both are meeting end on; see last paragraph of Art. 18.

Three lights on Port Bow.

When all three lights are seen on port bow, stand on (Art. 21); the ship showing the three lights keeps clear (Art. 19.) This is not a case where both are meeting end on; see last paragraph of Art. 18.

Overtaken.

When being overtaken by another ship, show a white light or flare up over the stern (Art. 10) The ship which is overtaking the other, whether a sailing ship or steamship keeps clear (Art. 24.)

Sailing ships and Steamships.

A steamship always keeps clear of a sailing ship, unless being overtaken by the sailing ship.

SAILING SHIPS.

Free with wind on Starboard side.

Keep clear of all green lights to leeward or ahead, and stand on for all red lights to windward.

Free with wind on Port side.

Keep clear of all red lights to leeward or ahead, and stand on for all green lights to windward, unless the green light has the wind on starboard side.

Light on weather bow.

An opposite coloured light on the weather bow, must have the wind aft or on the quarter.

Note.—It is well to hold hard on to this rule, as many candidates have failed through fancying they knew of a special case where the light was close hauled on the opposite tack;

the position the light was placed by the examiner being a clear case of a ship running free.

Close hauled on either tack.

If an opposite coloured light be less than four points on the lee bow, it will be on the opposite tack, and if more than four points on the lee bow it will be on the same tack.

Wind abeam on either side.

If an opposite coloured light be less than *two* points on the lee bow it will be close hauled on the opposite tack ; if three points on the lee bow it will be in stays ; if more than four points on the lee bow, it will be on the same tack.

Wind abaft the beam on either side.

All opposite coloured lights to leeward will be on the same tack.

WIND ABEAM STARBOARD SIDE.

Note.—The following examples refer to Art. 17.

1. You see a red light on the starboard beam what would you do ?

Stand on ; the other ship has the wind on the same side ; and consequently is the weather ship.

2. Suppose the red light is four points on the weather bow ?

Stand on ; the other ship is the weather ship, with the wind on the starboard quarter, or she has got the wind aft.

3. Suppose the red light is a point and a half on the weather bow ?

Stand on ; the other ship has the wind aft, or on the port quarter.

Wind on the Starboard quarter.

Stand on for all the red lights to windward ; if the light is on the beam the other ship will be going the same way, and be the weather ship, or she will have the wind aft, and if the light be on the bow, the other ship will have the wind aft or on the port quarter.

Note.—When the light is about one point on the weather bow, it might be a ship close hauled, but much more likely a ship running free with the wind on the port quarter. This is the case alluded to on page 38. (see note.)

Close hauled on Starboard tack.

Suppose a red light to be on the weather beam, the other ship would be going the same way or running free with the wind on the same side; suppose the light is four points on the weather bow, the other ship would be free and to windward; and suppose the light to be two points on the bow, then the other ship would have the wind aft or on the starboard quarter. It is clear in the three cases just mentioned you would have to stand on.

Wind on Starboard beam (free ship.)

4. Suppose you see a green light anywhere between two points on the lee bow and ahead, what would you do?

Keep clear; the other ship is close hauled on the port tack.

5. Suppose it is three points on the lee bow?

Keep clear, the other ship will be in stays, unless she was a ship that lay closer than six points to the wind then she might be close-hauled on the starboard tack.

6. Suppose it is more than four points on the lee bow?

Keep clear, the other ship is on the same tack.

Wind on the Starboard quarter.

7. You see a green light three points on the lee bow, what would you do?

Keep clear, the other ship will have the wind about abeam of close hauled on starboard tack.

8. You see the light about two points before the lee beam?

Keep clear, the other ship can have the wind anywhere on the starboard side, and consequently I will be the weather ship.

Close hauled on Starboard tack.

9. You see a green light anywhere within four points on the lee bow, what would you do?

Stand on; the other ship is on the port tack.

10. You see the light to leeward?

The other ship is going the same way, I will be the weather ship.

Note.—in this case Art. 17 does not say which ship keeps clear. It relates more to Art. 27, although it is generally understood that the weather ship is to keep clear.

Both side lights ahead.

11. You are close hauled on starboard tack and see both side lights of another ship ahead?

Stand on; the other ship is free.

12. Suppose you have the wind abeam?

Stand on! the other ship has the wind on the port beam.

13. Suppose you have the wind a couple of points abaft the beam?

Keep clear; the other ship is close hauled.

Note.—The following cases are practically the same as the previous ones, only the wind is on the opposite side.

Wind abeam on Port side.

14. A green light on the weather beam must keep clear, as she is the weather ship, having the wind anywhere on the port side.

15. A green light four points on the weather bow would have to keep clear, as she is the weather ship or got the wind aft.

16. A green light a point and a half on the weather bow can have the wind aft and would keep clear, but she can also have the wind on the starboard quarter, then you would have to keep clear because you are running free with the wind on the port side. (Ambiguous case.)

Wind on Port quarter.

17. A green light abeam to windward would be the weather ship or have the wind aft, and would have to keep clear.

18. A green light on the weather bow would have to keep clear with the wind aft, but with the wind on the starboard quarter you would have to keep clear, because you are free with the wind on the port side. (Ambiguous case.)

Close hauled on Port tack.

19. A green light on the weather beam would be going the same way, or running free with the wind on the same side.

20. A green light four points on the weather bow would be free and to windward.

21. A green light two points on the weather bow would be free and to windward or have the wind aft.

22. In the above three cases you would have to stand on.

Wind abeam Port Side.

23. A red light within two points on lee bow would be close hauled on starboard tack.

24. A red light three points on lee bow would be in stays.

25. A red light more than four points on lee bow would be on same tack.

26. In the above three cases you would keep clear, because you are a free ship.

Wind on Port Quarter.

27. A red light two points before the lee beam would be going the same way or close hauled on port tack.

28. A red light on the lee bow would be either free or close hauled on the port tack.

29. In the above two cases you would have to give way, because you are the weather ship.

Close hauled on Port Tack.

30. A red light within four points on the lee bow would be on the opposite tack close hauled, and I would have to give way, but it is possible that a red light one point on the lee bow can be free, then I should have to stand on.

31. A red light more than four points on the lee bow would be going the same way, and I should most likely luff a little to let the other ship get ahead, unless he went ahead himself by keeping his ship away a little. (Art. 27.)

Note.—Art. 17 is silent on this case, but as previously remarked, it is generally understood the weather ship will keep clear.

Special Cases.

32. It is hazy, you are running with the wind on starboard quarter, and suddenly you see a red light two points on the weather bow; what would you do?

Luff. (Art. 27.) The other ship is running across your bow; and it would be impossible for her to get out of the way.

33. It is hazy, you are in a steamship and suddenly see a green light on your port bow, very close, what would you do?

Go full speed astern, or anything that I thought would be best to avert collision. (Arts. 21—note, and 27.)

REGULATIONS FOR PREVENTING COLLISIONS AT SEA, 1897.

PRELIMINARY.

These Rules shall be followed by all vessels upon the high seas and in all waters connected therewith, navigable by sea-going vessels.

In the following Rules every steam vessel which is under sail and not under steam is to be considered a sailing vessel, and every vessel under steam, whether under sail or not, is to be considered a steam vessel.

The word "steam vessel" shall include any vessel propelled by machinery.

A vessel is "under way" within the meaning of these Rules when she is not at anchor, or made fast to the shore or aground.

RULES CONCERNING LIGHTS, &c.

The word "visible" in these Rules, when applied to lights, shall mean visible on a dark night with a clear atmosphere.

ARTICLE 1.—The Rules concerning lights shall be complied with in all weathers from sunset to sunrise, and during such time no other lights which may be mistaken for the prescribed lights shall be exhibited.

Steamships under way.

ART. 2.—A steam vessel when under way shall carry—

(*a.*) On or in front of the foremast, or if a vessel without a foremast, then in the fore part of the vessel, at a height above the hull of not less than 20 feet, and if the breadth of the vessel exceeds 20 feet, then at a height above the hull of not less than such breadth, so, however, that the light need not be carried at a greater height above the hull than 40 feet, a bright white light so constructed as to show an unbroken light over an arc of the horizon of 20 points of the compass, so fixed as to throw the light 10 points on each side of the vessel, viz.; from right ahead to 2 points abaft the beam on either side, and of such a character as to be visible at a distance of at least 5 miles.

(*b.*) On the starboard side a green light so constructed as to show an unbroken light over an arc of the horizon of 10 points of the compass, so fixed as to throw the light from right ahead to 2 points abaft the beam on the starboard side, and of such a character as to be visible at a distance of at least 2 miles.

(*c.*) On the port side a red light so constructed as to show an unbroken light over an arc of the horizon of 10 points of the compass, so fixed as to throw the light from right ahead to 2 points abaft the beam on the port side, and of such a character as to be visible at a distance of at least 2 miles.

(*d.*) The said green and red side lights shall be fitted with inboard screens projecting at least 3 feet forward from the light, so as to prevent these lights from being seen across the bow.

(*e.*) A steam vessel when under way may carry an additional white light similar in construction to the light mentioned in subdivision (*a*). These two lights shall be so placed in line with the keel that one shall be at least 15 feet higher than the other, and in such a position with reference to each other that the lower light shall be forward of the upper one. The vertical distance between these lights shall be less than the horizontal distance.

Steamships Towing.

ART. 3.—A steam vessel, when towing another vessel, shall, in addition to her side lights, carry two bright white lights in a vertical line one over the other, not less than six feet apart; and when towing more than one vessel, shall carry an additional bright white light 6 feet above or below such lights, if the length of the tow, measuring from the stern of the towing vessel to the stern of the last vessel towed exceeds 600 feet. Each of these lights shall be of the same construction and character, and shall be carried in the same position as the white light mentioned in Article 2 (*a*), except the additional light, which may be carried at a height of not less than 14 feet above the hull.

Such steam vessel may carry a small white light abaft the funnel or aftermast for the vessel towed to steer by, but such light shall not be visible forward of the beam.

Vessels Not Under Command and Laying Cables.

ART. 4.—(*a*) A vessel which, from any accident is not under command, shall carry at the same height as the white light mentioned in Art. 2 (*a*), where they can best be seen; and, if a steam vessel, in lieu of that light, two red lights in a vertical line one over the other, not less than six feet apart, and of such a character as to be visible all round the horizon at a distance of at least 2 miles; and shall by day carry in a vertical line one over the other, not less than six feet apart, where they can best be seen, two black balls or shapes, each 2 feet in diameter.

(*b*) A vessel employed in laying or in picking up a telegraph cable shall carry in the same position as the white light mentioned in Article 2 (*a*), and, if a steam vessel, in lieu of that light, three lights in a vertical line one over the other, not less than 6 feet apart. The highest and lowest of these lights shall be red, and the middle light shall be white, and they shall be of such a character as to be visible all round the horizon, at a distance of at least 2 miles. By day she shall carry in a vertical line one over the other not less than 6 feet apart, where they can best be seen, three shapes not less than 2 feet in diameter, of which the highest and lowest shall be globular in shape and red in colour, and the middle one diamond in shape and white.

(*c*) The vessels referred to in this Article, when not making way through the water, shall not carry the side lights, but when making way shall carry them.

(*d*) The lights and shapes required to be shown by this Article are to be taken by other vessels as signals that the vessel showing them is not under command and cannot therefore get out of the way.

These signals are not signals of vessels in distress and requiring assistance. Such signals are contained in Article 31.

Sailing Ships Under Way and any Vessel being Towed.

ART. 5.—A sailing vessel under way and any vessel being towed, shall carry the same lights as are prescribed by Article 2 for a steam vessel under way, with the exception of the white light mentioned therein, which they shall never carry.

Small Sailing Vessels.

ART. 6.—Whenever, as in the case of small vessels under way during bad weather, the green and red side lights cannot be fixed, these lights shall be kept at hand lighted and ready for use; and shall on the approach of or to other vessels, be exhibited on their respective sides in sufficient time to prevent collision, in such manner as to make them most visible, and so that the green light shall not be seen on the port side nor the red light on the starboard side, nor, if practicable, more than 2 points abaft the beam on their respective sides.

To make the use of these portable lights more certain and easy, the lanterns containing them shall each be painted outside with the colour of the light they respectively contain, and shall be provided with proper screens.

Small Steam Vessels or Vessels under Oars.

Art. 7.—Steam vessels of less than 40, and vessels under oars or sails of less than 20, tons gross tonnage respectively, and rowing boats, when under way, shall not be obliged to carry the lights mentioned in Article 2 (*a*) (*b*) and (*c*), but if they do not carry them they shall be provided with the following lights:—

1. Steam vessels of less than 40 tons shall carry:
   (*a*.) In the fore part of the vessel, or on or in front of the funnel, where it can best be seen, and at a height above the gunwale of not less than 9 feet, a bright white light constructed and fixed as prescribed in Article 2 (*a*), and of such a character as to be visible at a distance of at least 2 miles.
   (*b*.) Green and red side-lights constructed and fixed as prescribed in Article 2 (*b*) and (*c*), and of such a character as to be visible at a distance of at least 1 mile, or a combined lantern showing a green light and a red light from right ahead to 2 points abaft the beam on their respective sides. Such lantern shall be carried not less than 3 feet below the white light.
2. Small steamboats, such as are carried by sea-going vessels; may carry the white light at a less height than 9 feet above the gunwale, but it shall be carried above the combined lantern, mentioned in subdivision 1 (*b*).
3. Vessels under oars or sails, of less than 20 tons, shall have ready at hand a lantern with a green glass on one side and a red glass on the other, which, on the approach of or to other vessels, shall be exhibited in sufficient time to prevent collision, so that the green light shall not be seen on the port side nor the red light on the starboard side.
4. Rowing boats, whether under oars or sails, shall have ready at hand a lantern showing a white light, which shall be temporarily exhibited in sufficient time to prevent collision.

The vessels referred to in this Article shall not be obliged to carry the lights prescribed by Article 4 (*a*), and Article 11, last paragraph.

Pilot Vessels (Sailing).

ART. 8.—Pilot vessels, when engaged on their station on pilotage duty, shall not show the lights required for other vessels, but shall carry a white light at the masthead, visible all round the horizon, and shall also exhibit a flare-up light or flare-up lights at short intervals, which shall never exceed fifteen minutes.

On the near approach of, or to other vessels, they shall have their side-lights lighted, ready for use, and shall flash or show them at short intervals, to indicate the direction in which they are heading, but the green light shall not be shown on the port side, nor the red light on the starboard side.

A pilot-vessel of such a class as to be obliged to go alongside of a vessel to put a pilot on board, may show the white light instead of carrying it at the masthead, and may, instead of the coloured lights above-mentioned, have at hand ready for use a lantern with a green glass on the one side and a red glass on the other, to be used as prescribed above.

Pilot-vessels when not engaged on their station on pilotage duty, shall carry lights similar to those of other vessels of their tonnage.

ART. 9.*—See order now in force, page 53.

Vessels being Overtaken.

ART. 10.—A vessel which is being overtaken by another shall show from her stern to such last-mentioned vessel a white light or a flare-up light.

The white light required to be shown by this Article may be fixed and carried in a lantern, but in such case the lantern shall be so constructed, fitted, and screened that it shall throw an unbroken light over an arc of the horizon of 12 points of the compass, viz., for 6 points from right aft on each side of the vessel, so as to be visible at a distance of at least 1 mile. Such light shall be carried as nearly as practicable on the same level as the side-lights.

Vessels at Anchor.

ART. 11.—A vessel under 150 feet in length, when at anchor, shall carry forward, where it can best be seen, but at a height not exceeding 20 feet above the hull, a white light in a lantern so constructed as to show a clear, uniform, and unbroken light visible all round the horizon at a distance of at least 1 mile.

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* This Article will deal with regulations affecting fishing boats, and will be the subject of another Order, which will be submitted to His Majesty for approval at a later date.

A vessel of 150 feet or upwards in length, when at anchor, shall carry in the forward part of the vessel, at a height of not less than 20, and not exceeding 40, feet above the hull, one such light, and at or near the stern of the vessel, and at such a height that it shall not be less than 15 feet lower than the forward light, another such light.

The length of the vessel shall be deemed to be the length appearing in her certificate of registry.

A vessel aground in or near a fairway shall carry the above light or lights and the two red lights prescribed by Article 4 (*a*).

Flare-up, &c., Signals.

Art. 12.—Every Vessel may, if necessary, in order to attract attention, in addition to the lights which she is by these Rules required to carry, show a flare-up light or use any detonating signal that cannot be mistaken for a distress signal.

Special Signal Lights.

Art. 13.—Nothing in the rules shall interfere with the operation of any special rules made by the Government of any nation with respect to additional station signal lights for two or more ships of war or for vessels sailing under convoy, or with the exhibition of recognition signals adopted by shipowners, which have been authorised by their respective Governments and duly registered and published.

Steamship under Sail only.

Art. 14.—A steam vessel proceeding under sail only, but having her funnel up, shall carry in daytime, forward, where it can best be seen, one black ball or shape 2 feet in diameter.

Sound Signals for Fog, &c.

Art. 15.—All signals prescribed by this Article for vessels under way shall be given:

1. By "steam vessels" on the whistle or siren.
2. By "sailing vessels and vessels towed" on the fog horn.

The words "prolonged blast" used in this article, shall mean a blast of from 4 to 6 seconds duration.

A steam vessel shall be provided with an efficient whistle or siren, sounded by steam or some substitute for steam, so placed that the sound may not be intercepted by any obstruction, and with an efficient fog-horn, to be sounded by mechanical means, and also with an efficient bell.* A sailing vessel of 20 tons gross tonnage or upwards shall be provided with a similar fog horn and bell.

In fog, mist, falling snow, or heavy rain storms, whether by day or night, the signals described in this Article shall be used as follows; viz.:—

(*a.*) A steam vessel having way upon her, shall sound, at intervals of not more than 2 minutes, a prolonged blast.

(*b.*) A steam vessel under way, but stopped and having no way upon her, shall sound, at intervals of not more than 2 minutes, 2 prolonged blasts, with an interval of about 1 second between them.

(*c*) A sailing-vessel under way shall sound, at interv of not more than one minute, when on the starboard tack one blast, when on the port tack two blasts in succession, and when with the wind abaft the beam, three blasts in succession.

(*d.*) A vessel, when at anchor, shall, at intervals of not more than one minute, ring the bell rapidly for about five seconds.

(*e.*) A vessel, when towing, a vessel employed in laying or in picking up a telegraph cable, and a vessel under way, which is unable to get out of the way of an approaching vessel through being not under command, or unable to manœuvre as required by these Rules, shall, instead of the signals prescribed in subdivisions (*a*) and (*c*) of this Article, at intervals of not more than 2 minutes, sound three blasts in succession, viz.: one prolonged blast followed by two short blasts. A vessel towed may give this signal, and she shall not give any other.

Sailing-vessels and boats of less than 20 tons gross tonnage shall not be obliged to give the above-mentioned signals, but if they do not, they shall make some other efficient sound signal at intervals of not more than 1 minute.

Speed of Ships to be Moderate in Fog, &c.

Art. 16.—Every vessel shall, in a fog, mist, or falling snow or heavy rain storms, go at a moderate speed, having careful regard to the existing circumstances and conditions.

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* In all cases where the Rules require a bell to be used a drum may be substituted on board Turkish vessels, or a gong where such articles are used on board small sea-going vessels.

A steam vessel hearing, apparently forward of her beam, the fog signal of a vessel, the position of which is not ascertained, shall, so far as the circumstances of the case admit, stop her engines, and then navigate with caution until danger of collision is over.

STEERAGE AND SAILING RULES.

PRELIMINARY.—RISK OF COLLISION.

Risk of collision can, when circumstances permit, be ascertained by carefully watching the compass bearing of an approaching vessel. If the bearing does not appreciably change, such risk should be deemed to exist.

Two Sailing Ships Meeting.

ART. 17.—When two sailing-vessels are approaching one another, so as to involve risk of collision, one of them shall keep out of the way of the other as follows, viz. :—

(*a.*) A vessel which is running free shall keep out of the way of a vessel which is close hauled.

(*b.*) A vessel which is close hauled on the port tack shall keep out of the way of a vessel which is close hauled on the starboard tack.

(*c.*) When both are running free, with the wind on different sides, the vessel which has the wind on the port side shall keep out of the way of the other.

(*d.*) When both are running free, with the wind on the same side, the vessel which is to windward shall keep out of the way of the vessel which is to leeward.

(*e.*) A vessel which has the wind aft shall keep out of the way of the other vessel.

Two Steamships Meeting end on.

ART. 18.—When two steam vessels are meeting, end on, or nearly end on, so as to involve risk of collision, each shall alter her course to starboard, so that each may pass on the port side of the other.

This article only applies to cases where vessels are meeting end on, or nearly end on, in such a manner as to involve risk of collision, and does not apply to two vessels which must, if both keep on their respective courses, pass clear of each other.

The only cases to which it does apply are, when each of the two vessels is end on, or nearly end on, to the other ; in other words, to cases in which, by day, each vessel sees the masts of the other in a line, or nearly in a line, with her own; and by night, to cases in which each vessel is in such a position as to see both the side lights of the other.

It does not apply, by day, to cases in which a vessel sees another ahead crossing her own course; or by night, to cases where the red light of one vessel is opposed to the red light of the other, or where the green light of one vessel is opposed to the green light of the other, or where a red light without a green light, or a green light without a red light, is seen ahead, or where both green and red lights are seen anywhere but ahead.

Steam Vessels Crossing.

ART. 19.—When two steam-vessels are crossing, so as to involve risk of collision, the vessel which has the other on her own starboard side shall keep out of the way of the other.

Steam & Sailing Ships.

ART. 20.—When a steam-vessel and a sailing-vessel are proceeding in such directions as to involve risk of collision, the steam-vessel shall keep out of the way of the sailing-vessel.

Risk of Collision.

ART. 21.—Where by any of these rules one of two vessels is to keep out of the way, the other shall keep her course and speed.

Note.—When, in consequence of thick weather or other causes, such vessel finds herself so close that collision cannot be avoided by the action of the giving-way vessel alone, she also shall take such action as will best aid to avert collision. (*See* Articles 27 and 29.)

Avoid Crossing Ahead.

ART. 22.—Every vessel which is directed by these Rules to keep out of the way of another vessel shall, if the circumstances of the case admit, avoid crossing ahead of the other.

Slacken Speed or Stop.

ART 23.—Every steam-vessel which is directed by these Rules to keep out of the way of another vessel shall, on approaching her, if necessary, slacken her speed or stop or reverse.

Overtaking Vessel.

ART. 24.—Nothwithstanding anything contained in these Rules, every vessel, overtaking any other, shall keep out of the way of the overtaken vessel.

Every vessel coming up with another vessel from any direction more than two points abaft her beam, *i.e.*, in such a position, with reference to the vessel which she is overtaking that at night she would be unable to see either of that vessel's side lights, shall be deemed to be an overtaking vessel; and no subsequent alteration of the bearing between the two vessels shall make the overtaking vessel a crossing vessel within the meaning of these Rules, or relieve her of the duty of keeping clear of the overtaken vessel until she is finally past and clear.

As by day the overtaking vessel cannot always know with certainty whether she is forward of or abaft this direction from the other vessel, she should, if in doubt, assume that she is an overtaking vessel and keep out of the way.

In Narrow Channels.

Art. 25.—In narrow channels every steam-vessel shall, when it is safe and practicable, keep to that side of the fair-way or mid-channel which lies on the starboard side of such vessel.

Avoid Fishing Boats, &c.

Art. 26.—Sailing vessels under way shall keep out of the way of sailing vessels or boats fishing with nets, or lines, or trawls. This Rule shall not give to any vessel or boat engaged in fishing the right of obstructing a fairway used by vessels other than fishing vessels or boats.

Special Circumstances.

Art. 27.—In obeying and construing these Rules, due regard shall be had to all dangers of navigation and collision, and to any special circumstances which may render a departure from the above Rules necessary in order to avoid immediate danger.

Sound Signals for Vessels in Sight of One Another.

Art. 28.—The words "short blast" used in this Article shall mean a blast of about one second's duration.

When vessels are in sight of one another, a steam vessel under way, in taking any course authorised or required by these Rules, shall indicate that course by the following signals on her whistle or siren, viz.:—

One short blast to mean, "I am directing my course to starboard."

Two short blasts to mean, "I am directing my course to port."

Three short blasts to mean, "My engines are going full speed astern."

No Vessel under any Circumstances to neglect proper Precautions.

Art. 29.—Nothing in these Rules shall exonerate any vessel, or the owner, or master, or crew thereof, from the consequences of any neglect to carry lights or signals, or of any neglect to keep a proper look-out, or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.

Reservation of Rules for Harbours and Inland Navigation.

Art. 30.—Nothing in these Rules shall interfere with the operation of a special rule, duly made by local authority, relative to the navigation of any harbour, river, or inland waters.

SCHEDULE II.

Distress Signals.

Art. 31.—When a vessel is in distress and requires assistance from other vessels or from the shore, the following shall be the signals to be used or displayed by her, either together or separately, viz.:—

In the daytime—

1. A gun or other explosive signal fired at intervals of about a minute;
2. The International Code signal of distress indicated by N.C.
3. The distant signal, consisting of a square flag, having either above or below it a ball or anything resembling a ball;
4. A continuous sounding with any fog signal apparatus.

At night—

1. A gun or other explosive signal fired at intervals of about a minute;
2. Flames on the vessel (as from a burning tar-barrel, oil-barrel, &c.);
3. Rockets or shells, throwing stars of any colour or description, fired one at a time, at short intervals.
4. A continuous sounding with any fog-signal apparatus.

SCHEDULE.

Art. 9.—Open Boats and Fishing Vessels.

Art. 9.—Open boats and fishing vessels of less than 20 tons net registered tonnage, when under way and when not having their nets, trawls, dredges, or lines in the water, shall not be obliged to carry the coloured side lights; but every such boat and vessel shall in lieu thereof have ready at hand a lantern with a green glass on the one side and a red glass on the other side, and on approaching to or being approached by another vessel such lantern shall be exhibited in sufficient time to prevent collision, so that the green light shall not be seen on the port side nor the red light on the starboard side.

The following portion of this article applies only to fishing vessels and boats when in the sea off the coast of Europe lying north of Cape Finisterre:

(*a.*) All fishing vessels and fishing boats of 20 tons net registered tonnage, or upwards, when under way and when not required by the following regulations in this Article to carry and show the lights therein named, shall carry and show the same lights as other vessels under way.

(*b.*) All vessels when engaged in fishing with drift nets shall exhibit two white lights from any part of the vessel where they can be best seen. Such lights shall be placed so that the vertical distance between them shall be not less than six feet and not more than 10 feet; and so that the horizontal distance between them measured in a line with the keel of the vessel shall be not less than 5 feet and not more than 10 feet. The lower of these two lights shall be the more forward, and both of them shall be of such a character, and contained in lanterns of such construction as to show all round the horizon, on a dark night with a clear atmosphere, for a distance of not less than three miles.

(*c.*) A vessel employed in line fishing with her lines out shall carry the same lights as a vessel when engaged in fishing with drift nets.

(*d.*) If a vessel when fishing becomes stationary in consequence of her gear getting fast to a rock or other obstruction, she shall show the light and make the fog-signal for a vessel at anchor.

(*e.*) Fishing vessels and open boats may at any time use a flare-up in addition to the lights which they are by this Article required to carry and show. All flare-up lights exhibited by a vessel when trawling, dredging, or fishing with any kind of drag net shall be shown at the after part of the vessel, excepting that, if the vessel is hanging by the stern to her trawl, dredge, or drag net, they shall be exhibited from the bow.

(*f*.) Every fishing vessel and every open boat when at anchor between sunset and sunrise shall exhibit a white light visible all round the horizon at a distance of at least one mile.

(*g*.) In fog, mist, or falling snow, a drift net vessel attached to her nets, and a vessel when trawling, dredging, or fishing with any kind of drag net, and a vessel employed in line fishing with her lines out, shall at intervals of not more than two minutes make a blast with her fog horn and ring her bell alternately.

Trawlers' Lights.

As regards steam vessels engaged in trawling when under steam, such vessels, if of 20 tons gross register tonnage or upwards, and having their trawls in the water, and not being stationary in consequence of their gear getting fast to a rock or other obstruction, shall between sunset and sunrise either carry and show the lights required by the Article 2 of the Regulations, or shall carry and show in lieu thereof and in substitution therefor, but not in addition thereto, other lights of the description set forth in Part I. of the Schedule hereto.

As regards sailing vessels engaged in trawling, such vessels if of 20 tons net register tonnage or upwards, and having their trawls in the water, and not being stationary in consequence of their gear getting fast to a rock or other obstruction, shall between sunset and sunrise either carry and show the lights required by Article 5 of the Regulations, or shall carry and show in lieu thereof, and in substitution therefor, but not in addition thereto, other lights of the description set forth in part II. of the Schedule hereto.

The red and green lights, which are by this order permitted as aforesaid to be carried in lieu of the lights required by Articles 2 and 5 of the said recited Regulations respectively, and shall be of such a character as to be visible at a distance of not less than two miles on a dark night, with a clear atmosphere.

And His Majesty is pleased further to direct that steam vessels of 20 tons gross register tonnage or upwards, and sailing vessels of 20 tons net register tonnage or upwards, engaged in trawling, when under way between sunset and sunrise, but not having their trawls in the water, shall, if steam ships, carry and show the lights required by Article 2; and, if sailing ships, shall carry and show the lights required by Article 5: Provided, however, that the modifications and additions set forth in Parts I., II., of the Schedule hereto shall not be applicable to the fishing vessels and boats of any foreign country, unless and until the same shall have been made applicable thereto by Order in Council.

Schedule, Part I. Steam Vessels (Trawlers).

(1.) On or in front of the foremast head and in the same position as the white light which other steam ships are required to carry, a lanthorn, showing a white light ahead, a green light on the starboard side, and a red light on the port side; such lanthorn shall be so constructed, fitted, and arranged as to show an uniform and unbroken white light over an arc of the horizon of four points of the compass, an uniform and unbroken green light over an arc of the horizon of 10 points of the compass, and an uniform and unbroken red light over an arc of the horizon of 10 points of the compass, and it shall be so fixed as to show the white light from right ahead to two points on the bow, on each side of the ship, the green light from two points on the starboard bow to four points abaft the beam on the starboard side, and the red light from two points on the port bow to four points abaft the beam on the port side: and (2.) a white light in a globular lanthorn of not less than eight inches in diameter, and so constructed as to show a clear, uniform, and unbroken light all round the horizon; the lanthorn containing such white light shall be carried lower than the lanthorn showing the green, white, and red lights as aforesaid, so, however, that the vertical distance between them shall not be less than 6 feet nor more than 12 feet.

Schedule, Part II. Sailing Vessels. (Trawlers.)

(1.) On or in front of the foremast head a lanthorn having a green glass on the starboard side and a red glass on the port side, so constructed, fitted, and arranged that the red and green do not converge, and so as to show an uniform and unbroken green light over an arc of the horizon of 12 points of the compass, and an uniform and unbroken red light over an arc of the horizon of 12 points of the compass; and it shall be so fixed as to show the green light from right ahead to four points abaft the beam on the starboard side, and the red light from right ahead to four points abaft the beam on the port side: and (2.) a white light in a globular lanthorn of not less than eight inches in diameter, and so constructed as to show a clear uniform and unbroken light all round the horizon; the lanthorn containing such white light shall be carried lower than the lanthorn showing the green and red lights as aforesaid, so, however, that the vertical distance between them shall not be less than 6 feet and not more than 12 feet.

As regards sailing vessels engaged in trawling, such vessels having their trawls in the water and not being stationary in consequence of their gear getting fast to a rock or other obstruction, if they do not carry and show the lights required by Article 5 of the Regulations aforesaid, or the other lights of the description set forth in Part 2 of the Schedule to the said recited Order in Council of the 30th of December, 1884, shall carry and show in lieu of the lights required by Article 5 of the Regulations aforesaid, or the other lights of the description set forth in paragraph 2 of the Schedule to the said recited Order, other lights as follows; that is to say,—

A white light in a globular lanthorn of not less than eight inches in diameter, and so constructed as to show a clear uniform and unbroken light all round the horizon, and visible on a dark night, with a clear atmosphere, for a distance of at least 2 miles; and also a sufficient supply of red pyrotechnic lights which shall each burn for at least 30 seconds, and shall, when so burning, be visible for the same distance under the same conditions as the white light. The white light shall be shown from sunset to sunrise, and one of the red pyrotechnic lights shall be shown on approaching, or on being approached by another ship or vessel in sufficient time to prevent collision.

SCHEDULE.

Steam Pilot Vessels.

A steam pilot vessel exclusively employed for the service of Pilots licensed or certified by any Pilotage authority or the Committee of any Pilotage District in the United Kingdom when engaged on her station on pilotage Duty and in British waters and not at anchor shall in addition to the lights required for all pilot boats carry at a distance of eight feet below her white masthead light a red light visible all round the horizon and of such a character as to be visible on a dark night with a clear atmosphere at a distance of at least two miles and also the coloured side lights required to be carried by vessels when under way.

When engaged on her station on pilotage duty and in British waters and at anchor she shall carry in addition to the lights required for all pilot boats the red light above mentioned, but not the coloured side lights.

When not engaged on her station on pilotage duty she shall carry the same lights as other steam vessels.

RULE OF THE ROAD FOR STEAM SHIPS.

AID TO MEMORY, BY THOMAS GRAY.

Two Steam Ships Meeting.

When all three Lights I see ahead,
I port my helm, and show my RED.

Two Steam Ships passing clear.

GREEN to GREEN—or RED to RED—
Perfect safety—Go ahead!

Two Steam Ships crossing.

NOTE.—This is the position of greatest danger; there is nothing for it but a good look-out, caution, and judgment.

If to my Starboard RED appear,
It is my duty to keep clear;
To act as judgment says is proper:—
To Port—or Starboard—Back— or Stop her!

But when upon *my* Port is seen
A Steamer's Starboard Light of GREEN,
There's naught for me to do but see
That GREEN to Port keeps clear of me.

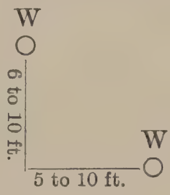
Both in safety and in doubt
I always keep a good look-out!
In danger, with no room to turn,
I ease her!—Stop her!—Go astern!

SYNOPSIS OF LIGHTS TO BE CARRIED AND SHOWN BY ALL STEAM & SAILING VESSELS, TRAWLERS, FISHING BOATS, &c.

Mast Head Lights must be at least 20 feet and need not be more than 40 feet above the Deck, Side Lights must show from Right ahead to 2 points abaft the Beam.

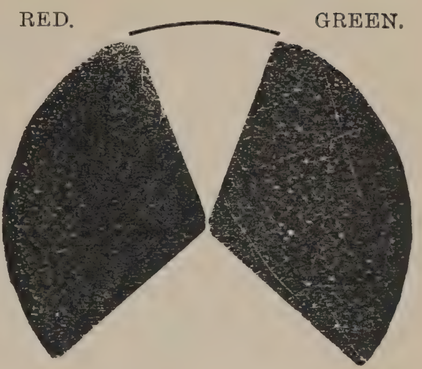
		Distance visible. Miles.
Steam Ships Under Way.	White Mast Head Light, Green and Red Side Lights. A Steam Ship may also carry an additional Mast Head Light.	5 2 5
Steam Vessels less than 40 tons.	White Mast Head Light 9 ft. above gunwale, also Side Lights.	2 1
Vessels under Oars or Sails, less than 20 tons.	(1) Shall have ready at hand a Lantern with Red and Green glass, or (2) a Lantern showing a White Light.	
Steam Ships Towing.	Two White Mast Head Lights vertical (at least 6 ft. apart) and Green and Red Side Lights. If towing more than one vessel and the length of tow exceed 600 ft., an additional White Light will have to be carried. A White Light abaft the funnel may also be carried.	5 2 5
Steam Ships and Sailing Ships not under Command.	*At Night*—Two Red Lights ● Red Vertical—6 ft. apart ● Red *By Day*—Two Black Balls or Shapes Vertical—6 ft. apart, at least 2 ft. in diameter, and when making way at night, in addition Red and Green side lights.	2

		Visible Miles.
STEAM SHIPS AND SHIPS LAYING TELEGRAPH CABLES.	*At Night*—Three Lights—Red, White, and Red. Vertical—6 ft. apart ● Red ○ White ● Red *By Day*—Red Ball, White Diamond Shape, Red Ball, not less than 6 ft. apart—thus ● Red <> White ● Red and when *making way* at night, in addition, Red and Green Side Lights.	2
FLARE-UP FOR ANY VESSEL.	Every Vessel may show a flare-up, or use any detonating signal to attract attention.	
SAILING SHIPS UNDER WAY OR ANY VESSEL BEING TOWED.	Red and Green Side Lights.	2
OPEN FISHING BOATS UNDER WAY (LESS THAN 20 TONS).	Lantern with Red and Green Slides.	
STEAM SHIPS AND OTHER VESSELS AT ANCHOR. (UNDER 150 FT.)	White Light, visible all round the Horizon, and not to exceed 20 ft. above the Hull.	1
OVER 150 FT.	Two White Lights, the forward one not less than 20 and not more than 40 ft. above the hull, the one near the stern not less than 15 ft. below the forward Light.	1
VESSEL AGROUND IN A FAIRWAY.	Lights for a Vessel at anchor, also Lights for a Ship not under command.	1 2
SAILING PILOT VESSELS.	White Mast Head Light, and Flare-up at intervals of at least every 15 minutes also Side Lights at short intervals when nearing other vessels. A Sailing Pilot obliged to go alongside another vessel, may show the White Light instead of carrying it at the Mast Head, and have a lantern ready at hand with a red and green glass.	

		Visible Miles.
Pilot Steam Vessels (under way).	White Mast Head Light, and Red Light below it thus—8 ft. apart. ○ White ● Red also Side Lights and White Flare.	2
Pilot Steam Vessels (at anchor).	White Mast Head Light and Red Light 8 ft. below, both visible all round the horizon. ○ White ● Red also Flare up.	2
Pilot Vessels not on Pilotage Duty.	Same as other ships.	
Vessels Drift Net Fishing.	Two Bright White Lights (visible all round the Horizon) where best seen.  In addition a flare up on approach of other vessels.	3
Boats with Lines.	Same as drifting.	
Fishing Boats Stationary.	Fast to Rocks, &c.—Same as ships at anchor.	
Fishing Boats at Anchor.	Same as other ships.	
Fishing Boats and Trawlers in Fog, &c.	In Fog or Snow showers (attached to their Nets, &c.) shall use a Fog Horn and Ring a Bell alternately every two minutes.	

		Visible Miles.
Steam Ships and Sailing Ships Overtaking One Another	The one a-head to show from her stern a White Light (may be fixed) or Flare up.	1
Steam Ship under Sail only, with Funnel up	One Black Ball, forward, 2 feet in diameter.	
Steam Ships in thick Weather.	Slacken Speed. Go easy. Blow Whistle or Siren at least every 2 minutes, and be provided with a Fog Horn and Bell. *Day and Night*—Ring Bell rapidly every minute when NOT under way.	
Steam Ships stopped under Way in thick Weather.	Two prolonged blasts every 2 minutes.	
Sailing Ships in thick Weather.	Use Fog Horn (1, 2, or 3 Blasts) to indicate what she is doing, *Day and Night*—Ring bell rapidly every minute when NOT under way.	
Vessel towing or being towed, Vessel Laying or Picking up Telegraph Cable, or Vessel not under Command in thick Weather.	Three Blasts, one prolonged and two short, at intervals of not more than two minutes.	
Steam Vessels Trawling.	(1) At Mast Head, Lantern with Red, White, and Green Lights. White showing a-head over 4 points, Red and Green showing over 10 points each and underneath this a White Light (visible all round the Horizon). The Lanterns to be at least 6 ft. apart, and not to exceed 12 feet.	

Steam Vessels Trawling. (Continued.)



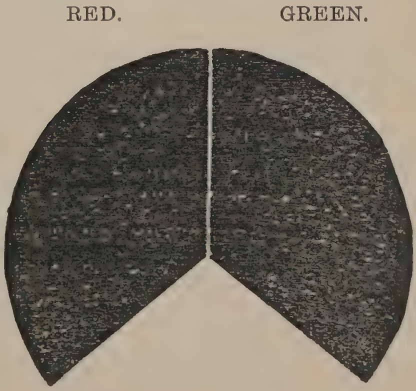
Red, and Green Lights to show to 4 points abaft the Beam.

or

(2) Same as other steam ships under way.

Sailing Ships Trawling.

(1) At Mast Head, Lantern with Red and Green Lights showing over 12 points each, and underneath a White Light (visible all round the Horizon) the Lanterns to be at least 6 ft. apart, and not to exceed 12 ft.



		Visible Miles.
	or	
SAILING SHIPS TRAWLING. (Continued.)	(2) At the Mast Head, White Light (visible all round the horizon) and Red Pyrotechnic Lights (to burn 30 seconds) on approaching other vessels.	2
	or	
	(3) Same as other Sailing Ships under way.	
VESSELS MARKING WRECKED SHIPS.	Hull painted green (Wreck in White Letters). *Night Time*—2 Bright White Lights on passing side. 1 Bright White Light on other side. *Day Time*—2 Black Balls on passing side. 1 Black Ball on other side. *In Fog* — Ring the Bell and sound Gong alternately.	
LIGHT VESSELS OUT OF POSITION AND NO GOOD FOR NAVIGATION.	*Night Time*—1 Red Light Forward. 1 Red Light Aft. *Day Time* — Balls and Distinguishing Marks *Struck*, 1 Red Flag Forward, 1 Red Flag Aft.	

NEW REGULATIONS

AS TO

LIGHTS AND SIGNALS OF FISHING VESSELS.

MAY 1ST, 1906.

(These Regulations supersede Fishing Lights given in "Reed's Seamanship," pages 53 *to* 57, *also* 61 *to* 64.*)*

ART. 9.—Fishing-vessels and fishing-boats, when under way and when not required by this Article to carry or show the lights hereinafter specified, shall carry or show the lights prescribed for vessels of their tonnage under way.

(*a*) Open boats, by which is to be understood boats not protected from the entry of sea water by means of a continuous deck, when engaged in any fishing at night, with outlying tackle extending not more than 150 feet horizontally from the boat into the seaway, shall carry one all-round white light.

Open boats, when fishing at night, with outlying tackle extending more than 150 feet horizontally from the boat into the seaway, shall carry one all-round white light, and in addition, on approaching or being approached by other vessels, shall show a second white light at least 3 feet below the first light and at a horizontal distance of at least 5 feet away from it in the direction in which the outlying tackle is attached.

(*b*) Vessels and boats, except open boats as defined in sub-division (*a*), when fishing with drift nets, shall, so long as the nets are wholly or partly in the water, carry two white lights where they can best be seen. Such lights shall be placed so that the vertical distance between them shall be not less than 6 feet and not more than 15 feet, and so that the horizontal distance between them, measured in a line with the keel, shall be not less than 5 feet and not more than 10 feet. The lower of these two lights shall be in the direction of the nets, and both of them shall be of such a character as to show all round the horizon, and to be visible at a distance of not less than 3 miles.

Within the Mediterranean Sea and in the seas bordering the coasts of Japan and Korea sailing fishing vessels of less than 20 tons gross tonnage shall not be obliged to carry the lower of these two lights; should they, however, not carry it, they shall show in the same position (in the direction of the net or gear) a white light, visible at a distance of not less than one sea mile, on the approach of or to other vessels.

(*c*) Vessels and boats, except open boats as defined in sub-division (*a*), when line fishing with their lines out and attached to or hauling their lines, and when not at anchor or stationary within the meaning of sub-division (*h*), shall carry the same lights as vessels fishing with drift nets. When shooting lines, or fishing with towing lines, they shall carry the lights prescribed for a steam or sailing vessel under way respectively.

Within the Mediterranean Sea and in the seas bordering the coasts of Japan and Korea sailing fishing vessels of less than 20 tons gross tonnage shall not be obliged to carry the lower of these two lights; should they, however, not carry it, they shall show in the same position (in the direction of the lines) a white light, visible at a distance of not less than one sea mile on the approach of or to other vessels.

(*d*) Vessels, when engaged in trawling, by which is meant the dragging of an apparatus along the bottom of the sea—

1. If steam-vessels, shall carry in the same position as the white light mentioned in Article 2 (*a*), a tricoloured lantern so constructed and fixed as to show a white light from right ahead to two points on each bow, and a green light and a red light over an arc of the horizon from two points on each bow to two points abaft the beam on the starboard and port sides respectively; and not less than 6 nor more than 12 feet below the tricoloured lantern a white light in a lantern so constructed as to show a clear uniform and unbroken light all round the horizon.

2. If sailing vessels, shall carry a white light in a lantern, so constructed as to show a clear uniform and unbroken light all round the horizon, and shall also, on the approach of or to other vessels, show where it can best be seen a white flare-up light or torch in sufficient time to prevent collision.

All lights mentioned in sub-division (*d*) 1 and 2 shall be visible at a distance of at least 2 miles.

(*e*) Oyster dredgers and other vessels fishing with dredge-nets shall carry and show the same lights as trawlers.

(*f*) Fishing vessels and fishing-boats may at any time use a flare-up light in addition to the lights which they are by this Article required to carry and show, and they may also use working lights.

(*g*) Every fishing-vessel and every fishing-boat under 150 feet in length, when at anchor, shall exhibit a white light visible all round the horizon at a distance of at least one mile.

Every fishing-vessel of 150 feet in length or upwards, when at anchor, shall exhibit a white light visible all round the horizon at a distance of at least one mile, and shall exhibit a second light as provided for vessels of such length by Article 11.

Should any such vessel, whether under 150 feet in length, or of 150 feet in length or upwards, be attached to a net or other fishing gear, she shall on the approach of other vessels show an additional white light at least 3 feet below the anchor light, and at a horizontal distance of at least 5 feet away from it in the direction of the net or gear.

(*h*) If a vessel or boat when fishing becomes stationary in consequence of her gear getting fast to a rock or other obstruction, she shall in daytime haul down the day-signal required by sub-division (*k*); at night show the light or lights prescribed for a vessel at anchor; and during fog, mist, falling snow, or heavy rain-storms make the signal prescribed for a vessel at anchor. (See sub-division (*d*), and the last paragraph, of Article 15.)

(*i*) In fog, mist, falling snow or heavy rain-storms, drift-net vessels attached to their nets, and vessels when trawling, dredging, or fishing with any kind of drag-net, and vessels line fishing with their lines out, shall, if of 20 tons gross tonnage or upwards, respectively, at intervals of not more than one minute make a blast; if steam-vessels, with the whistle or syren, and if sailing-vessels with the fog-horn; each blast to be followed by ringing the bell. Fishing vessels and boats of less than 20 tons gross tonnage shall not be obliged to give the above mentioned signals; but if they do not, they shall make some other efficient sound signal at intervals of not more than one minute.

(*k*) All vessels or boats fishing with nets or lines or trawls, when under way, shall in daytime indicate their occupation to an approaching vessel by displaying a basket or other efficient signal where it can best be seen. If vessels or boats at anchor have their gear out, they shall, on the approach of other vessels, show the same signal on the side on which those vessels can pass.

The vessels required by this Article to carry or show the lights hereinbefore specified shall not be obliged to carry the lights prescribed by Article 4 (*a*), and the last paragraph of Article 11.

This Article shall be read and construed as part of the Regulations contained in Schedule I. to the Order in Council under Section 418 of the Merchant Shipping Act, 1894, made the 27th day November, 1896, and as if it had formed one of such Regulations and been numbered 9 among the Articles containing the same.

WARNING SIGNALS.

MORSE CODE SIGNALS.

The following Urgent and Important Signals may be made at night or in thick weather, either by long and short flashes of light or by long and short sounds on a steam-whistle, siren, fog horn, etc.:—

For example :—The first signal below, which in the Morse Alphabet represents the letter U, is made by two short and one long flashes or blasts, *i.e.*, ▪ ▪ ▬, and means "You are standing into danger."

INSTRUCTIONS FOR THE USE OF FLASHING OR SOUND SIGNALS.

1.—With flashing signals the lamp must always be turned towards the person addressed.

2.—To attract attention, a series of rapid short flashes or sounds should be made and continued until the person addressed gives the sign of attention by doing the same.

If, however, it is supposed that the person addressed cannot reply, the signal may be made after a moderate pause; or under certain circumstances, the communication may be made without preparatory signs.

3.—After making a few rapid short flashes or sounds as an acknowledgment, the receiver must watch or listen attentively until the communication is completed, when he must make the sign indicated below, showing that the message is understood.

4.—If the receiver does not understand the message, he must wait until the signal is repeated.

5.—Duration of short flashes or sounds ▪ .. 1 second.
,, ,, long ,, ,, ,, ▬ .. 3 seconds.
Interval between each flash or sound .. 1 second.
Answer, *or*, "I understand" ▬ ▪ ▬ ▪ ▬ ▪ ▬ ▪ etc.
Preparative signal to attract attention ▪ ▪ ▪ ▪ ▪ ▪ etc.

WARNING SIGNALS.—*Continued.*

You are standing into danger (U)	▪ ▪ ▬
I want assistance; remain by me (V)	▪ ▪ ▪ ▬
Have encountered ice (W)	▪ ▬ ▬
Your lights are out, (*or*, want trimming) (P) ..	▪ ▬ ▬ ▪
The way is off my ship; you may feel your way past me (R)	▪ ▬ ▪
Stop, *or*, heave-to; I have something important to communicate (L)	▪ ▬ ▪ ▪
Am disabled; communicate with me (F) ..	▪ ▪ ▬ ▪

When a vessel is in tow, the following signals may be made by *flashes* between her and the tug or towing vessel:—

Steer more to starboard	▪
Steer more to port	▪ ▪
Cast off hawsers	▪ ▪ ▪ ▪

FOG SIGNALS.

Sound is conveyed in a very capricious way through the atmosphere. Apart from wind, large areas of silence have been found in different directions and different distances from the signals, in some instances even when in close proximity to the sound signal.

The mariner should not assume:—

1. That he is out of ordinary hearing distance, because he fails to hear the sound.
2. That because he hears a fog signal faintly, that he is a great distance from it.
3. That he is near it, because he hears the sound plainly.
4. That the distance from and the intensity of the sound on any one occasion, is a guide to him for any future occasion.
5. That the fog signal has ceased sounding, because he does not hear it when in close proximity.

SIGNALS FOR A PILOT.

The following signals, when used or displayed together or separately, shall be deemed to be signals for a pilot :—

In the Daytime :—

(1.)—To be hoisted at the fore, the Union Jack. having round it a white border one-fifth the breadth of the flag.

(2.)—The International Code Pilotage Signal, indicated by P. T.

(3.)—The International Code Flag S., with or without Code Pennant over it.

(4.)—The distant signal consisting of a cone, point upwards, having above it two balls, or shapes resembling balls.

At Night :—

(1.)—The Pyrotechnic Light, commonly known as a blue light, every fifteen minutes.

(2.)—A Bright White light, flashed or shown at short or frequent intervals, just above the bulwarks for about a minute at a time.

ADDITIONAL SIGNAL OF DISTRESS.

The Distant Signal, consisting of a cone, point upwards, having either above it or below it a ball, or anything resembling a ball.

FOG SIGNAL FOR VESSELS MARKING WRECKS.

WRK.-MRK.-VS.—In addition to the fog-bell on board the Wrk.-Mrk.-Vs., placed by the Trinity House Corporation, a gong will be sounded, when practicable, the bell and gong being sounded in quick succession, at intervals of not more than one minute.

INSTRUCTIONS FOR USING THE MORTAR AND ROCKET APPARATUS FOR SAVING LIFE.

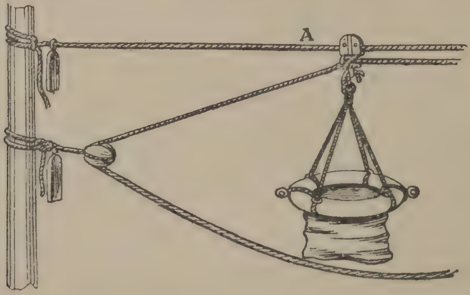
In the event of your vessel stranding within a short distance of the United Kingdom, and the lives of the crew being placed in danger, assistance will, if possible, be rendered from the shore in the following manner, namely,

1.—A rocket or shot with a thin line attached will be fired across your vessel. Get hold of this line as soon as you can and when you have secured it, let one of the crew be separated from the rest and, if in the day time, wave his hat or his hand, or a flag or handkerchief; or if at night let a rocket, a blue light, or a gun be fired, or let a light be displayed over the side of the ship and be again concealed as a signal to those on shore.

2.—When you see one of the men on shore separated from the rest wave a *Red* Flag, or (if at night) show a Red Light, and then conceal it, you are to haul upon the rocket line until you get a tailed block with an endless fall rove through it.

3.—Make the tail of the block fast to the mast about 15 feet above the deck, or if your masts are gone to the *highest secure* part of the vessel. When the tail block is made fast, and the rocket line unbent from the whip, let one of the crew, separated from the rest, make the signal required by Article 1 above.

Fig. 12.



4.—As soon as the signal is seen on shore, a hawser will be bent to the whip line, and will be hauled off to the ship by those on shore.

5.—When the hawser is got on board, the crew should at once make it fast to the same part of the ship as the tailed block is made fast to, only, about 18 inches higher, taking care that there are no turns of the whip line round the hawser.

6.—When the hawser has been made fast on board, the signal directed to be made in Article 1 above is to be repeated.

7.—The men on shore will then pull the hawser taut, and by means of the whip line will haul off to the ship a slung *breeches buoy*, into which the person to be hauled ashore is to get and be made fast. When he is in and secure, one of the crew must be separated from the rest, and again signal to the shore as directed in Article 1 above. The people on shore will then haul the person in the sling to the shore, and when he has landed, will haul back the empty sling to the ship for others. This operation will be repeated until all persons are hauled ashore from the wrecked vessel.

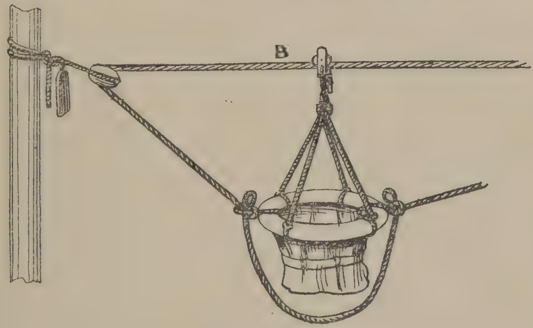


Fig. 13.

8.—It may sometimes happen that the state of the weather and the condition of the ship will not admit of a hawser being set up; in such cases the *breeches buoy* will be hauled off instead, and the shipwrecked persons will be hauled through the surf, instead of along a hawser.

Masters and crews of stranded vessels should bear in mind that SUCCESS in landing them in a great measure DEPENDS UPON THEIR COOLNESS AND ATTENTION TO THE RULES HERE LAID DOWN; and that by attending to them many lives are annually saved by the Mortar and Rocket Apparatus on the Coasts of the United Kingdom.

The system of signalling must be strictly adhered to; and all women, children, passengers, and helpless persons should be landed, before the crew of the ship.

WORMING, PARCELLING, AND SERVING.

To Worm.—Fill up the lay of the rope with spunyarn (worming with the lay) so as to make the surface of the rope even enough to parcel and serve.

To Parcel.—Pass round the rope (with the lay) pieces of tarred canvas about 2 inches in width, each turn slightly overlapping the previous one. When parcelling rigging always parcel upwards, so as to shed the water.

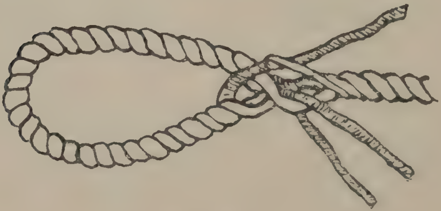
To Serve.—Two hands are usually necessary, one to turn the serving board or mallet, the other to pass the ball of spunyarn. Always serve the reverse way to parcelling and worming—against the lay.

Worm or parcel with the lay,
Turn and serve the other way.

SPLICING.

Eye Splice.—Unlay the strands a few inches, and place them on the standing part of the rope at such a distance as is necessary for the size of the eye. Enter the middle strand (unlaid) under a strand of the standing part of the rope, do likewise with the other two on their respective sides; taper each end and pass them through again. If neatness is desired, reduce the ends and pass them through once more; cut off smooth and serve the splice (if necessary) with spunyarn. (Fig. 14.)

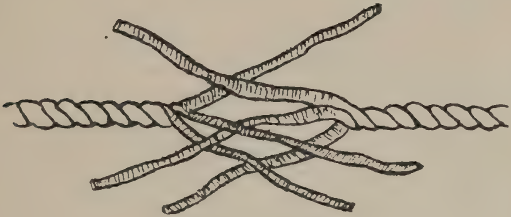
Fig. 14.



EYE SPLICE.

Short Splice.—Unlay each end a few inches, and crutch or marry them together; then pass each strand over one and under the next, twice each way. If neatness is desired, the strands should be halved before tucking the second time.

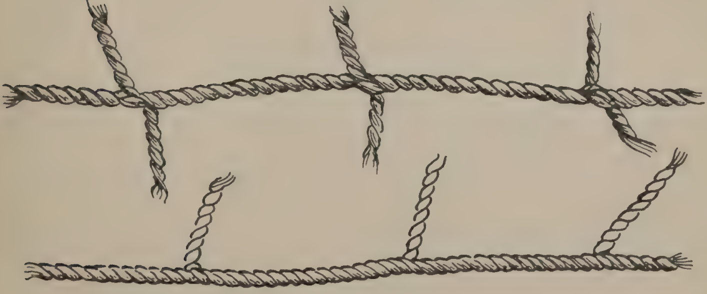
Fig. 15.



SHORT SPLICE.

Long Splice.—Unlay the strands at each end about three times as much (or more) as for a short splice; marry the two parts together, then unlay one strand still further, and follow up in the vacant space with the corresponding strand of the other part till only a few inches remain. Do likewise on the other side. There will then remain two long strands in the middle and a long and short on each side. The splice is now divided into three distinct parts. Divide the strands at each part, and tie the corresponding divisions together; then tuck each end in twice, dividing the strands again, if necessary, at the second tucking. This, and all other splices, should be well stretched and hammered into shape before cutting off the ends.

Fig. 16.



LONG SPLICE.

KNOTS, HITCHES, AND BENDS.

(*1.*) *Simple or Overhand.*

Pass the end of the rope round the standing part, and through the bight.

(*2.*) *Figure of Eight.*

Pass the end of the rope round the standing part, under its own part, and through the bight.

(*3.*) *Handspike Hitch.*

Place the spike on the rope and form a bight with the parts crossed, the spike being through the bight; then dip the spike under the underneath part of the rope and through the bight.

(*4.*) *Sheet or Common Bend.*

Pass the end of one rope through the bight formed by another, then round the two parts of this second rope and under the standing part of the first.

(*5.*) *Bowline.*

Place the end part on the standing part, and form a loop with the end through; pass the end under the standing part and bring it back through the loop.

(*6.*) *Marling Hitch.*

Make an overhand knot, and continue them about every two inches along the rope.

(*7.*) *Reef Knot.*

Pass the end of one part round the end part of the other, then bring the two ends back towards their standing parts, passing one part round the other again, so that the two parts of each end reeve through the bight the same way.

(*8.*) *Sheet Bend with Toggle.*

Pass the toggle through the middle of the knot.

(*9.*) *Carrick Bend.*

Pass the end of one rope through the crossed bight of another round the standing part, over the end part, and up through the loop under the standing part, both parts coming out at different sides.

(*10.*) *Slip.*

Pass the end of the rope round the standing part, and bring the bight formed by the end part through the bight formed by the standing part.

(11.) *Flemish Loop.*

Make a slip knot, and bend an overhand knot round the standing part.

(12.) *Chain Knot with Toggle.*

A chain knot with toggle is a succession of slip knots, the standing part being brought through each loop, and a toggle put through the last one.

(13.) *Bowline on the Bight.*

Place the bight over the two end parts, and form a loop with the bight through; pass the bight under the two end parts, and bring it back, through which reeve the bight formed by the double parts.

(14.) *Sheep Shank.*

Lay the bight of the rope in three parts, and hitch each end part round the bight of the other two parts.

(15.) *Cat's Paw.*

Take the bight of the rope in both hands, and form two bights, one in the left hand and the other in the right; roll these two bights along the end parts four or five turns.

(16.) *Half Hitch.*

Pass the end round the spar and standing part; then reeve under its own part.

(17.) *Timber Hitch.*

Pass the end round the spar and its own standing part; then pass several turns round its own part.

(18.) *Clove Hitch.*

Pass the end round the spar, crossing the standing part; then round the spar again, bringing the end through between the end part and standing part under its own part.

(*19.*) *Rolling Hitch.*

Pass the end twice round the spar, crossing the standing part on the top side each time; then hitch the end round the spar on the opposite side of the two turns.

(*20.*) *Timber Hitch and Half Hitch.*

Pass the end round the spar and over its own part, then make the timber hitch.

(*21.*) *Blackwall Hitch.*

Pass the end round the back of the hook, and under its own part, the end on one side of the hook and standing part on the other.

(*22.*) *Fisherman's Bend.*

Pass the end twice round the ring and under the turns. Stop the end back.

(*23.*) *Round Turn and Half Hitch.*

Pass the end twice round the ring, and make a half hitch round the standing part, stopping the end back to the standing part.

(*24.*) *Wall Knot Commenced.*

Unlay the strands sufficiently to form the knot, then form a bight with strand 1 and pass strand 2 round the end of it, also strand 3 round the end of 2 and through the bight of 1.

(*25.*) *Wall Knot Completed.*

Haul taut the ends, taking care to properly form the knot.

(*26.*) *Crown Commenced.*

Lay strand 1 over the centre of the wall, strand 2 over 1, and strand 3 over 2 and under 1.

(*27.*) *Crown Completed.*

Haul the strands taut and form the knot.

KNOTS, HITCHES, AND BENDS.

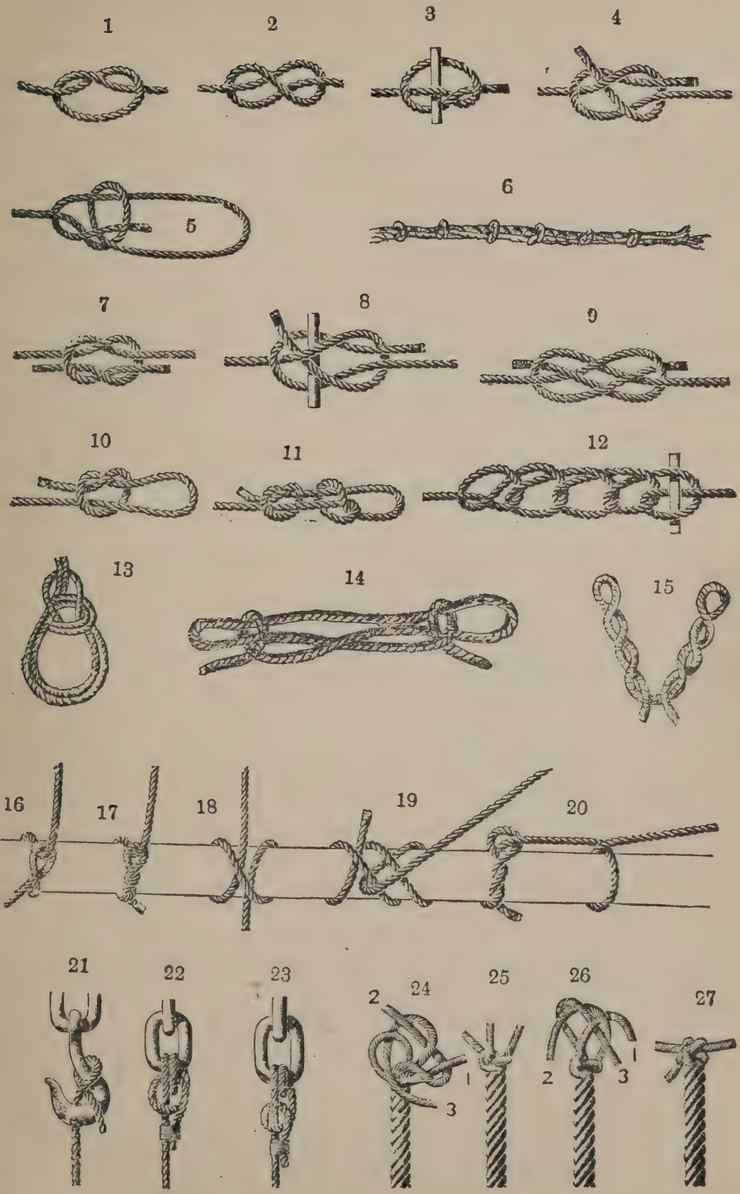


Fig. 17.

A FOUR-MASTED SHIP.*

The vessel illustrated in the two Plates, although not of the latest type, is purposely selected and at the same time exhibits the great advance made in the construction of merchant sailing ships. To the eye there is no very great difference between a large three-master and a four-master, but the latter possesses several advantages over the former. In a four-masted vessel the masts, yards, and sails do not require to be so large as in a three-master in order to receive an equal wind-pressure, the rigging has less height and greater spread transversely, and consequently there is less difficulty in working the ship, and less danger of dismasting. The wind-pressure is also more equally distributed fore and aft, and the centre of effort of the sails being lower down, the vessel heels over less and thus gains in speed, also answering better to her helm. Another advantage is that such vessels can be more easily managed in tacking and wearing at sea owing to the jigger-mast and fore-mast being nearer the ends of the ship, and thus giving a more powerful leverage when required. In the plate the fourth or jigger mast is barque-rigged, but it is often square-rigged like the others. A further advantage is that the dimensions of the three foremost masts and their yards can be so arranged that all the principal sails are interchangeable, so that only a limited number of spare sails is required. The vessel shewn in the plate carries upper and lower topsails and topgallant sails: this is an improvement that had been previously introduced in three-masted vessels. The adoption of the four-masted rig has enabled larger sailing vessels to be introduced than was found practicable with three masts, 2300 tons being about the extreme tonnage of three-masters, while four-masters range from about 2000 to 4000 tons. From their greater handiness, too, these vessels can be managed by a relatively smaller number of hands, and thus are less expensive to navigate.

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* These two Drawings of Ships are taken from "Ogilvie's Imperial Dictionary," by the kind permission of Messrs. Blackie & Son, of Glasgow, Publishers.

TERMS APPLIED TO THE HULL, SPARS AND STANDING RIGGING. (Fig. 18.)

THE HULL.

1 Head
2 Cutwater
3 Bow
4 Forecastle-deck
5 Stern
6 Rudder
7 Fore-chains
8 Main-chains
9 Mizzen-chains
10 Bulwarks
11 Poop-deck
12 Gun-ports
13 Trail-boards
14 Cat-head
15 Head-rails
16 Capstan
17 Skylight
18 Light-boards
19 Fore-deck house
20 Life-boats
21 Gig
22 Companion
23 Skylight
24 Wheel-box
25 Poop-rails
26 Afterdeck-house

THE SPARS.

27 Bowsprit
28 Inner jib-boom
29 Outer jib-boom
30 Flying jib-boom
31 Martingale
32 Fore-mast
33 Fore-topmast
34 Fore-topgallant mast
35 Fore-royal mast
36 Main-mast
37 Main-topmast
38 Main-topgallant mast
39 Main-royal mast
40 Mizzen-mast
41 Mizzen-topmast
42 Mizzen-topgallant mast
43 Mizzen-royal mast
44 Jigger-mast
45 Jigger-topmast
46 Jigger-topgallant mast
47 Fore-yard
48 Fore lower topsail yard
49 Fore upper topsail yard
50 Fore lower topgallant yard
51 Fore upper topgallant yard
52 Fore-royal yard
53 Main-yard
54 Main lower topsail yard
55 Main upper topsail yard
56 Main lower topgallant yard
57 Main upper topgallant yard
58 Main-royal yard
59 Crossjack yard
60 Mizzen lower topsail yard
61 Mizzen upper topsail yard
62 Mizzen lower topgallant yard
63 Mizzen upper topgallant yard
64 Mizzen-royal yard
65 Jigger gaff
66 Jigger boom
67 Fore-top
68 Main-top
69 Mizzen-top
70 Jigger-top
71 Fore-doublings
72 Fore-mast cap
73 Fore-topmast cross-trees
74 Fore-topmast cap
75 Ensign
76 Company's flag

THE STANDING RIGGING.

A 1 Bobstay
A 2 Bow-sprit shroud
A 3 Martingale-stay
A 4 Jib-boom guys
A 5 Fore-stays
A 6 Fore-topmast stays
A 7 Inner-jib stay
A 8 Outer-jib stay
A 9 Flying-jib stay
A 10 Fore-royal stay
A 11 Fore-rigging
A 12 Fore-topmast rigging
A 13 Fore-topgallant rigging
A 14 Fore-cap back-stay
A 15 Fore-topmast back-stays
A 16 Fore-topgallant back-stays

TERMS APPLIED TO THE HULL, SPARS AND STANDING RIGGING—*Continued.*

A 17 Fore-royal back-stay
A 18 Fore-lift
A 19 Fore-topsail lift
A 20 Fore-topgallant lift
A 21 Fore-royal lift
A 22 Main-stays
A 23 Main-topmast stays
A 24 Main-topgallant stays
A 25 Main-royal stays
A 26 Main-rigging
A 27 Main-topmast rigging
A 28 Main-topgallant rigging
A 29 Main-cap back-stay
A 30 Main-topmast back.stays
A 31 Main-topgallant back-stays
A 32 Main-royal back-stays
A 33 Main-lift
A 34 Main-topsail lift
A 35 Main-topgallant lift
A 36 Main-royal lift
A 37 Mizzen-stays
A 38 Mizzen-topmast stays
A 39 Mizzen-topgallant stay
A 40 Mizzen-royal stay
A 41 Mizzen-rigging
A 42 Mizzen-topmast rigging
A 43 Mizzen-topgallant rigging
A 44 Mizzen-cap back-stay
A 45 Mizzen-topmast back-stays
A 46 Mizzen-topgallantback-stays
A 47 Mizzen-royal back-stay
A 48 Cross jack lift
A 49 Mizzen-topsail lift
A 50 Mizzen-topgallant lift
A 51 Mizzen-royal lift
A 52 Jigger-stays
A 53 Jigger middle stay
A 54 Jigger-topmast stay
A 55 Jigger-topgallant stay
A 56 Jigger-rigging
A 57 Jigger-topmast rigging
A 58 Jigger-topmast back-stays
A 59 Jigger-topgallant back-stays

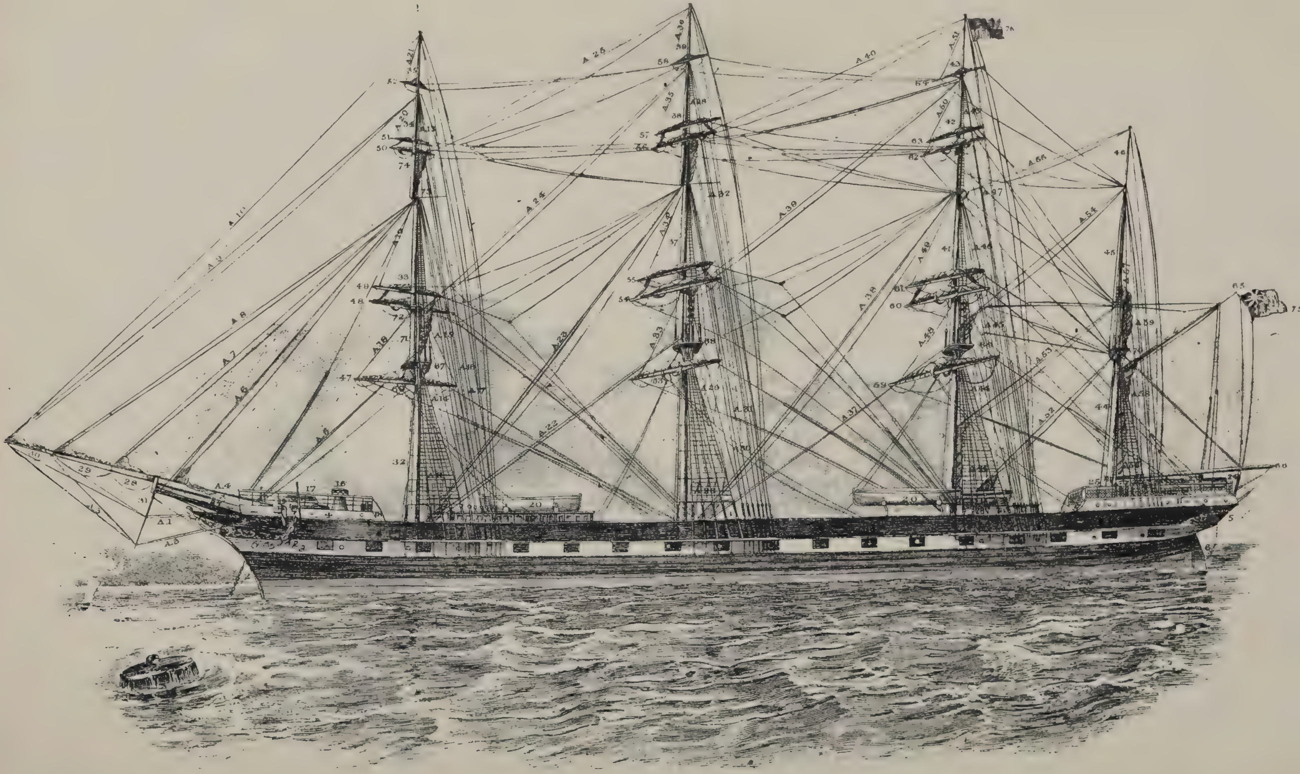
TERMS APPLIED TO THE SAILS AND RUNNING RIGGING. (Fig. 19.)

THE SAILS.

A 1 Fore-sail
A 2 Fore lower topsail
A 3 Fore upper topsail
A 4 Fore lower topgallant sail
A 5 Fore upper topgallant sail
A 6 Fore-royal
A 7 Main-sail
A 8 Main lower topsail
A 9 Main upper topsail
A 10 Main lower topgallant sail
A 11 Main upper topgallant sail
A 12 Main-royal
A 13 Crossjack
A 14 Mizzen lower topsail
A 15 Mizzen upper topsail
A 16 Mizzen lower topgallant sail
A 17 Mizzen upper topgallant sail
A 18 Mizzen-royal
A 19 Fore-topmast stay-sail
A 20 Inner-jib
A 21 Outer-jib
A 22 Flying-jib
A 23 Main-topmast stay-sail
A 24 Main-topgallant stay-sail
A 25 Main-royal stay-sail
A 26 Mizzen-topmast staysail
A 27 Mizzen-topgallant stay-sail
A 28 Mizzen-royal stay-sail
A 29 Jigger stay-sail
A 30 Jigger middle stay-sail
A 31 Jigger-topmast stay-sail
A 32 Jigger-topgallant stay-sail
A 33 Jigger
A 34 Gaff topsail

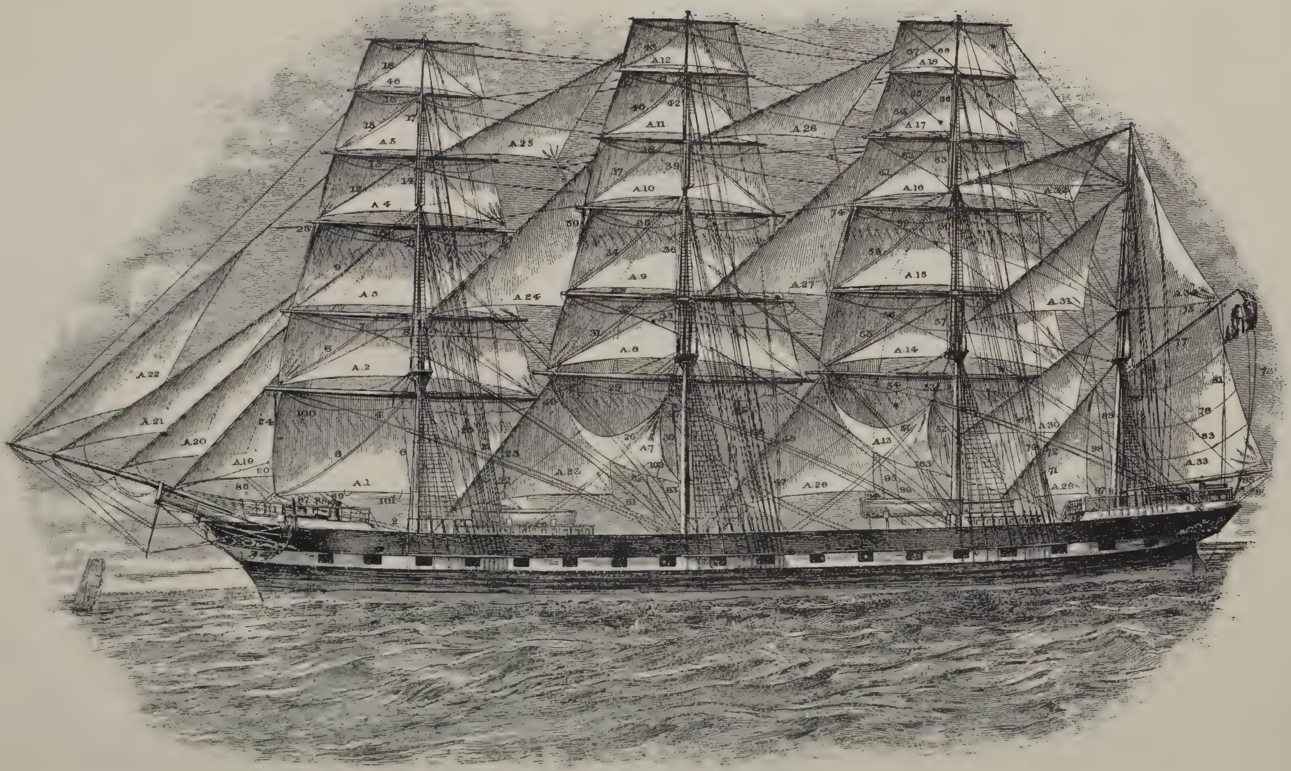
THE RUNNING RIGGING.

1 Fore-tack
2 Fore-sheet
3 Fore clew-garnet
4 Fore-braces
5 Fore lower topsail sheet
6 Fore lower topsail clew-lines
7 Fore lower topsail braces
8 Fore upper topsail sheets



[To face p. 78.]

Fig. 18.


A.1
A.2
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A.5
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A.9
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A.11
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A.32
A.33
A.34
100
101
102
103

Fig. 19.

Terms applied to the Sails and Running Rigging.—*Continued.*

9 Fore upper topsail clew-lines*
10 Fore upper topsail braces
11 Fore lower topgallant sheet
12 Fore lower topgallant clew-lines
13 Fore lower topgallant braces
14 Fore upper topgallant sheet
15 Fore upper topgallant clew-lines*
16 Fore upper topgallant braces
17 Fore-royal sheet
18 Fore-royal clew-lines
19 Fore-royal braces
20 Fore-topsail halyards
21 Fore-topgallant halyards
22 Fore-royal halyards
23 Fore-signal halyards
24 Fore reef-tackles
25 Fore-topsail reef-tackles
26 Main-tack
27 Main sheet
28 Main clew-garnet
29 Main-brace
30 Main lower topsail sheet
31 Main lower topsail clew-lines
32 Main lower topsail brace
33 Main upper topsail sheet
34 Main upper topsail clew-lines*
35 Main upper topsail braces
36 Main lower topgallant sheet
37 Main lower topgallant clew-lines
38 Main lower topgallant braces
39 Main upper topgallant sheet
40 do. do. clew-lines*
41 Main upper topgallant brace
42 Main-royal sheet
43 Main-royal clew-lines
44 Main-royal braces
45 Main-topsail halyards
46 Main-topgallant halyards
47 Main-royal halyards
48 Main signal-halyards
49 Main reef-tackles
50 Main-topsail reef-tackles
51 Crossjack tack
52 Crossjack sheet
53 Crossjack clew-garnet
54 Crossjack braces
55 Mizzen lower topsail clew-lines
56 Mizzen lower topsail braces
57 Mizzen upper topsail sheet
58 Mizzen upper topsail clew-lines
59 Mizzen upper topsail braces
60 Mizzen lower topgallant sheet
61 Mizzen lower topgallant clew-lines*
62 Mizzen lower topgallant braces
63 Mizzen upper topgallant sheet
64 Mizzen upper topgallant clew-lines*
65 Mizzen upper topgallant braces
66 Mizzen-royal sheet
67 Mizzen-royal clew-lines
68 Mizzen-royal braces
69 Mizzen-topsail halyards
70 Mizzen-topgallant halyards
71 Mizzen-royal halyards
72 Mizzen-signal halyards
73 Crossjack reef-tackles
74 Mizzen-topsail reef-tackles
75 Jigger peak-halyards
76 Jigger brails
77 Jigger gaff-topsail sheet
78 Ensign halyards
79 British ensign
80 Gaff-topsail halyards
81 Vangs
82 Jigger outhaul
83 Boom topping lift
84 Boom guys
85 Boom sheet
86 Flying-jib sheet
87 Outer-jib sheet
88 Inner-jib sheet
89 Fore-topmast stay-sail sheet
90 Fore-bowline
91 Main-topmast stay-sail sheet
92 Main-topgallant stay-sail sheet
93 Main-royal stay-sail sheet
94 Mizzen-topmast stay-sail sheet
95 Mizzen-topgallant stay-sail sheet
96 Mizzen-royal stay-sail sheet
97 Jigger stay-sail sheet
98 Jigger-topmast stay-sail sheet
99 Jigger-topgallant staysail sheet
100 Reef points
101 Fore-buntlines
102 Main-buntlines
103 Crossjack buntlines

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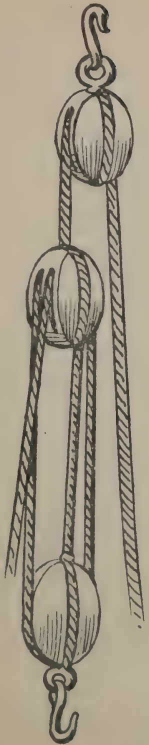
* Most ships do not have clew-lines on upper topsail and upper topgallant sails, their clews are either shackled to the lower yard arms, or have sheets made fast in the tops.

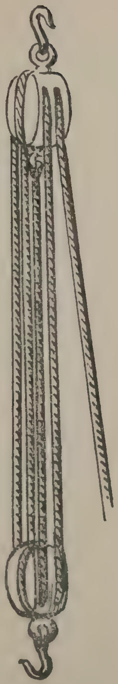
PURCHASES, &c.

Fig. 20.



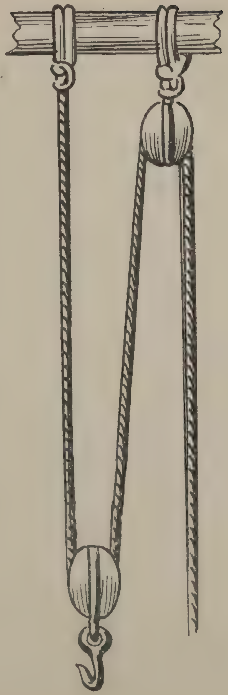
Runner & Tackle.

Fig. 21.



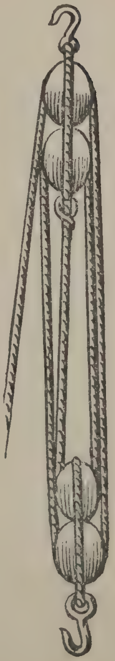
Two Fold Purchase.

Fig. 22.



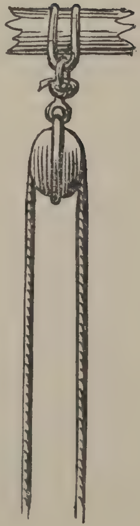
Double Whip.

Fig. 23.



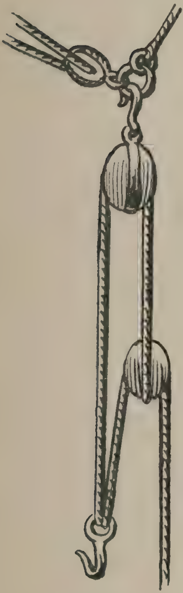
Long Tackle.

Fig 24.



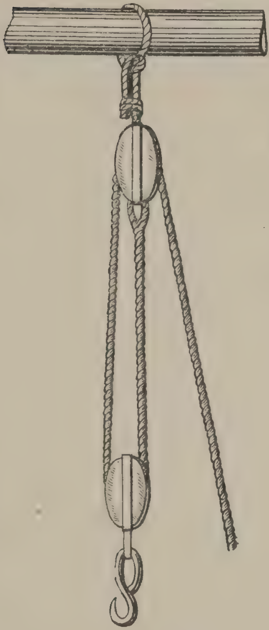
Single Whip.

Fig. 25.



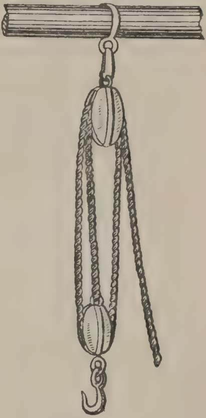
SPANISH BURTON.

Fig. 26.



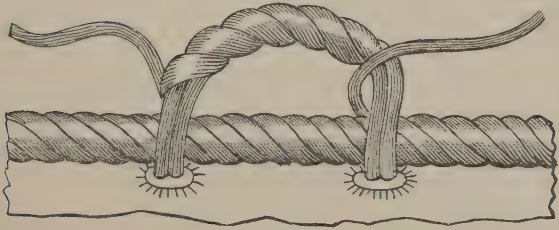
GUN TACKLE.

Fig. 27.



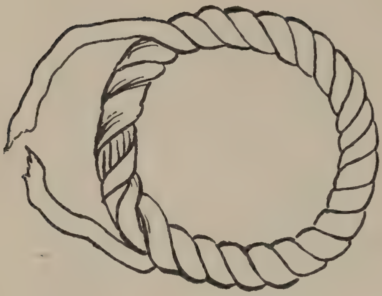
LUFF TACKLE.

Fig. 28.



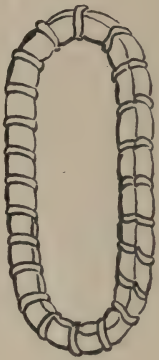
FOUR STRANDED CRINGLE.

Fig. 29.



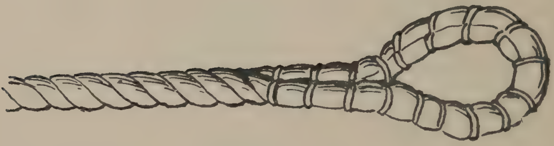
GRUMMET.

Fig. 30.



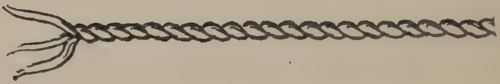
SELVAGEE STROP.

Fig. 31.



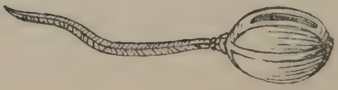
FLEMISH EYE.

Fig. 32.



HAWSER LAID ROPE.

Fig. 33.



TAIL BLOCK.

RIGGING, &c.

1. If you were appointed to a ship just launched, without even her lower masts, and were required to superintend the rigging of her, what would you have sent off first?

The spars for the sheers.

2. How would you have them placed alongside?

Thin ends aft.

3. How would you get them on board?

Hang skids over the sides, and parbuckle them on board.

4. Rig a pair of sheers?

Place the spars over the taffrail, with their heels even, cross them near their after ends, and then put on the head lashing; put two stout tackles on *each* heel, one to lead forward, the other aft; have two pieces of tough wood, one at each gangway as shoes; place a leg of the sheers on each shoe; haul taut the after heel-tackles and belay them; lash the upper purchase under the head lashing, middle a couple of hawsers and clove-hitch them over the sheer heads, having two parts leading forward and two aft; put a lufftackle at the end of each, to secure the sheers when the stress is on them; shore the decks from the skin up, the heads of the shores should press against a stout plank running fore and aft under the beams near the partners; the stress is thus divided amongst the beams instead of being concentrated on the beam the heel may at the moment rest upon.

5. What kind of head-lashing would you put on?

Figure of eight; some prefer a round lashing.

6. Where would you lash your upper purchase block?

As close up against the head lashing as I could get it.

7. What could you do to stiffen the sheers, that is, bind them to the deck better?

Have a shroud over the heads of the sheers a part leading down the side of each leg, and set up to ringbolts or anything that was handy.

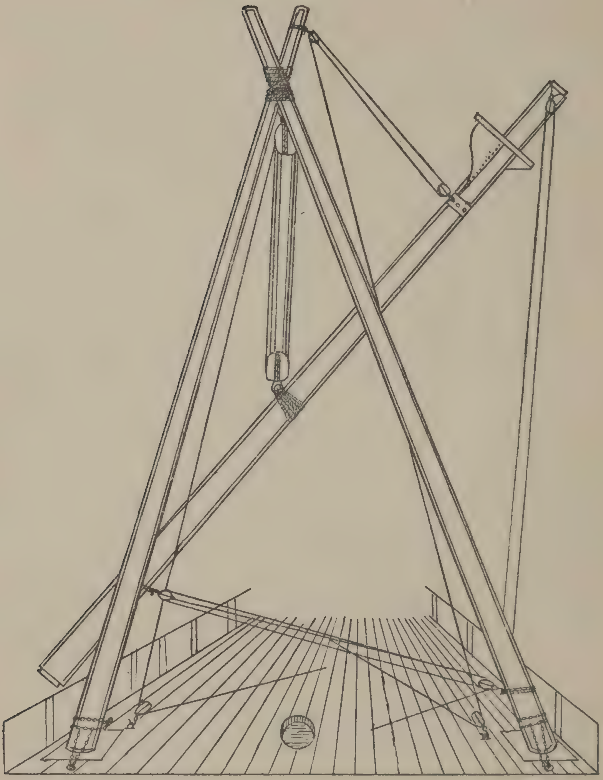
8. How should the mast be placed alongside?

With its head aft.

9. Which mast would you take in first.

The mizzen, then the main, and then the foremast.

Fig. 34.



TAKING IN LOWERMAST.

10. Take in your mast?

Measure the distance from the keelson to the deck, and lay this measurement along the mast from the heel; lash the lower purchase block a little above this mark to allow for stretching. Take the fall of the main purchase to the capstan and heave round; when the heel rises near the rail, hook on a heel-tackle to ease it inboard; get the mast fair for lowering by means of the girtlines; wipe the tenon dry, and white lead or tar both it and the step; lower away, and step the mast.

11. What would you do as the head of the mast appears above the rail?

Put on the girtline blocks for sending up the top, and reeve the girtlines from forward.

12. Where would you place the girtline blocks?

At the mast head where the lower cap will come.

13. What would you take in after your masts?

The bowsprit.

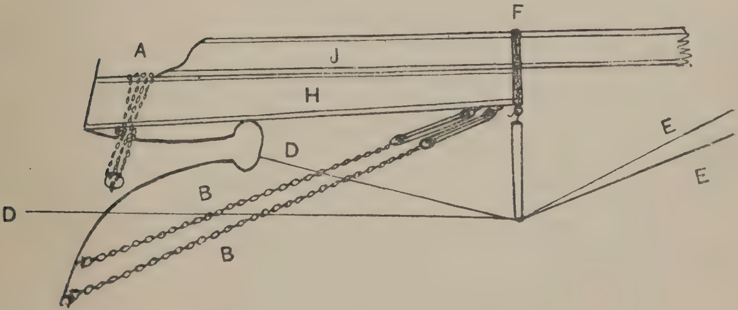
14. How would you take it in?

Over the bows with the sheers projecting forward and guyed from the foremast.

15. If the sheers won't rake far enough forward?

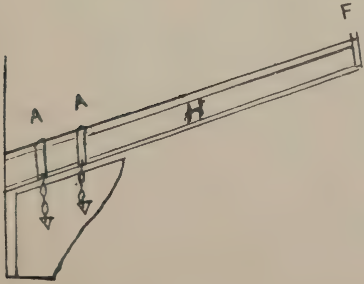
Rig a spar projecting over the bows, and heave out to get the heel between the knight heads.

Fig. 35.



BOWSPRIT AND JIB-BOOM.

Fig. 36.



A	Gammoning.
B	Bobstay.
D	Back Ropes.
E	Martingale Stays.
F	Cap.
H	Bowsprit.
J	Jibboom.

16. Suppose your bowsprit stepped, what would you do next?

Secure it.

17. How do you secure it?

By passing the gammoning and setting up the bobstays and shrouds.

In an iron ship the bowsprit is built into the ship, and in lieu of the gammoning, iron plates secure it to the stem. A strong iron bar is used for the bobstay.

18. How do you get the bowsprit down so as to set it up?

Rig out the jib-boom if I had plenty of room. If I am cramped for room hang a water-cask at the bowsprit end.

19. Your lowermasts being now in, what would you send up first?

The tops.

20. Where would you place the top before sending it up, and how?

Abaft the mast, with the fore part up and the under face against the mast.

21. Send it up? (See Fig. 37.)

The girtlines are already rove, hitch them to the after part of the top and stop them underneath to the cross-trees and to the fore rim of the top. Have a couple of guys leading forward and one aft; then heave away, and when the rim of the top reaches the blocks, cast off the stops, sway away again and cast off the other stops, the top will fall over the mast-head, steadying over with the fore and aft guys, then lower away and place it into position on the trestle-trees.

22 Do you know of any other way of getting the tops over the mast-heads?

Put them on as the masts are being taken in. Have them ready, and as the head of the mast appears above the rail place them over the mast heads into position.

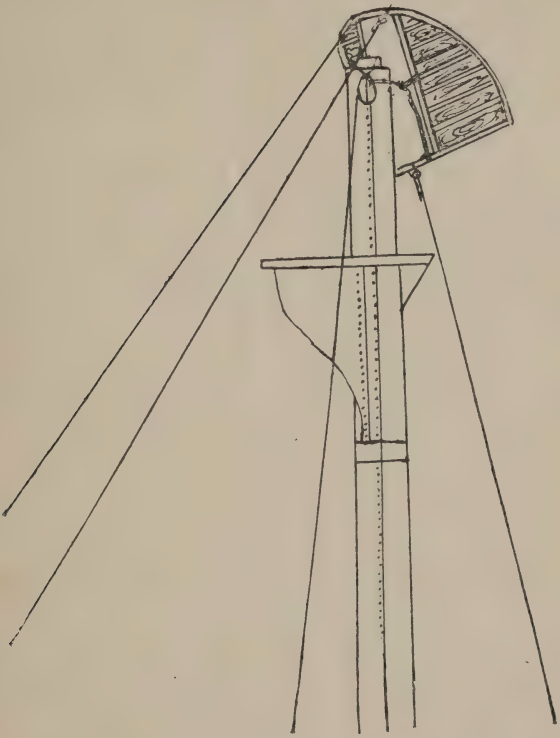
23. Supposing you have put on the top as above, and hooked on you heel tackle, while you are wiping your tenon, &c., you see a strand of your purchase breaking, what would you do?

Rack the parts together directly and keep it so till I got a fresh purchase up.

24. What would you send up?

The bolsters.

Fig. 37.



SENDING UP A TOP.

25. And then?

Send up the lower cap into the top by one of the girtlines at the mast-head.

26. What would you do next?

Shift the block to the after part of the trestle-tree for sending up the lower rigging.

27. What part of the rigging would you send up first?

The fore swifters (five shrouds on each side); if six on each side, there will be three pairs to starboard and port.

28. Go on?

Then the starboard forward pair of shrouds, next the port forward pair, then the starboard second pair, and then the port. (Always rig to starboard first.)

29. And next?

The fore-stay.

30. How would you send up a shroud?

Bend on the girtline with a timber hitch below the seizing of the eye, and stop it to the crown of the eye; sway up, and when high enough cast off the eye stop and place over the mast-head.

31. Suppose your mast-head were seven feet high, how far down from the crown of the eye would you bend on your girtline?

About 12 feet.

32. What part of the rigging would you set up first?

The fore-stay. Always stay the mast first.

33. How would you turn in a dead eye?

With the lay of the rope. Some are spliced and some are turned in and seized.

34. How would you reeve the lanyard, and why?

The hauling part of the lanyard under the standing part of the shroud, as it keeps the dead eye square and the strain on the standing part.

35. What kind of a knot would you make on the lanyard?

Either a single or double "Matthew Walker."

36. Where should the knot be placed?

Underneath the end of the shroud.

37. You are inboard, looking at a set of lower rigging being set up, where would the knot be?

With right-handed rigging, the knot would be aft on the port side and forward on the starboard side. It is always opposite to your left eye.

38. How do you form the eye of the shroud?

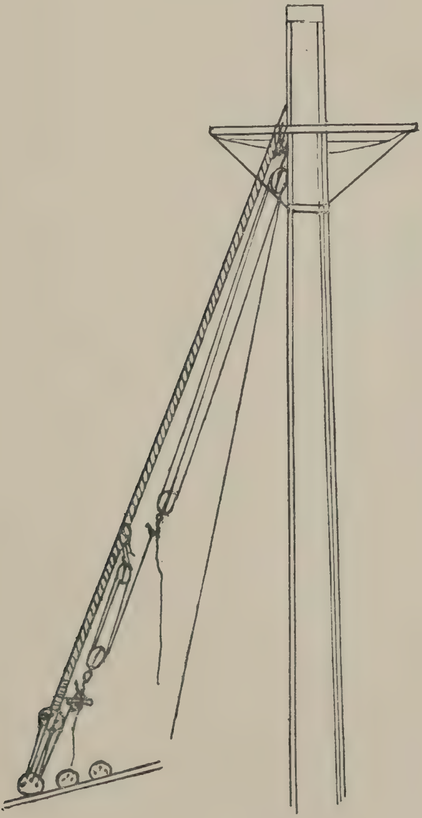
Divide the shroud into three equal parts; the middle part will be for the eye; worm it with the lay, put it on the stretch, parcel it with the lay from each end to the centre, and serve it against the lay from the centre towards each end, and then seize it.

39. How would you set up a shroud or backstay?

Luff upon luff; or with a tackle and runner.

NOTE.—Most modern ships have screw rigging, and consequently have no lanyards. The shroud or backstay is set up by simply turning the screw.

Fig. 38.



SETTING SHROUDS UP.

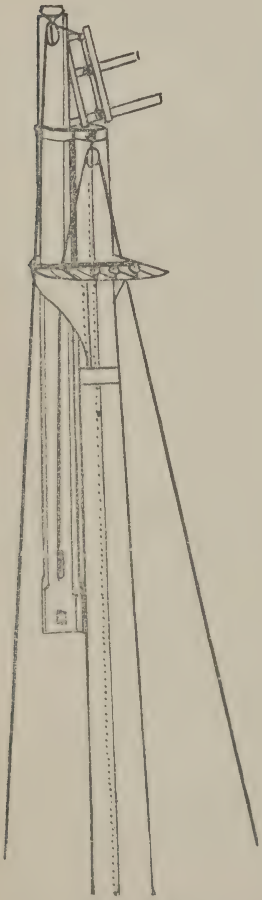
40. Why do you parcel rigging upwards?

To shed the water; if parcelled downwards the water would lodge inside the parcelling.

41. What allowance would you make for overlapping in the shrouds?

The breadth of a seizing larger than the one that precedes it.

Fig. 39.



SENDING TOPMAST UP.

42. Send the topmast up?

Lay the mast on the deck after side up and heel aft; hook a block to the eye-bolt at one side of the cap, and reeve the mast rope from aft, down through the square hole in the trestle-trees, along the mast and through the sheave hole in the heel of the mast; overhaul it along the mast towards the head and hitch it round the mast and the other part of the mast rope leaving enough end for doubling; rack the two parts together below the hitch; sway away and point the head of the mast through the trestle-trees; double the mast rope by casting the hitch adrift and taking it up through the trestle-trees and making it fast at the other side of the cap; come up the racking, and sway away again until the mast head is a few feet above the cap, then lash girtline blocks to the topmast head, reeving the girtlines from forward, overhauling them down to the deck; bend them to the after cross-tree legs and stop them to the fore; sway away until you can rest them with the after part resting on the lower mast head, fore part against the topmast, and the under side forward, lower the topmast, cut the stops and the cross-trees will fall over the mast head. If the topgallant hole in the cross-trees is likely to fall over or jamb, lash a batten across. Heave away again until the cross-trees rest in their proper place.

43. What will you do next?
Rig the topmast.

44. How?
First the bolsters, then the starboard rigging; next the port rigging, starboard backstays, port backstays, and the topmast stay last.

45. How does the topmast stay lead?
Under the fore cross-tree legs and over the after.
Some ships over both.

46. What would you do next?
Sway away and fid the mast, set up the topmast stay, rigging and backstays.

47. How would you send the lower cap up?
Send it up with the topmast. The cap having been previously hauled up on to the top and placed with the round hole over the square hole in the trestle-tress; when the topmast is pointed through the trestle-trees, lash the cap to the mast head, and when high enough slue the topmast and place the cap over the lowermast head, and beat it down into its place.

48. How would you send the topgallant-mast up?
The same way as the topmast, the only difference being in the rigging of it.

49. How would you rig it?
First the grummet or funnel, then the stay, rigging and backstays.

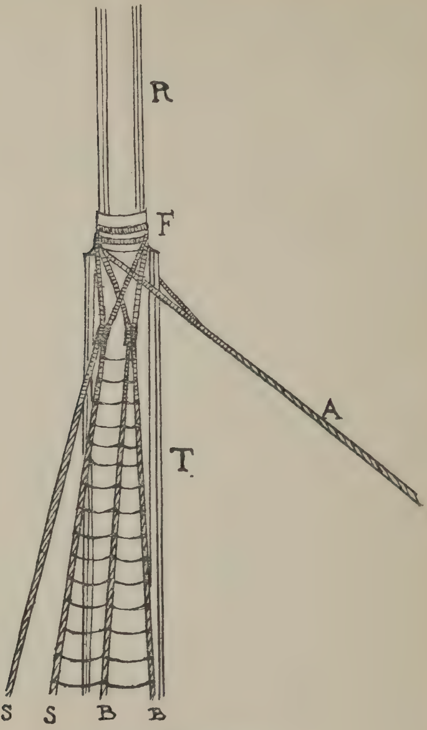
50. How would you rig the royal mast?
First the grummet, next the stay, and last the backstays.

51. When do you put topgallant and royal gear over the mast head?
Directly the mast is pointed through the topmast cap.

52. Which mast would you rig first? And why?
The foremast. Because I have the means of staying it; the main topgallant-mast, &c. cannot be stayed until after the foremast.

Fig. 40.

R	Royal Mast.
T	Topgallant-mast
F	Funnel.
A	Topgallant Stay.
B	Rigging.
S	Back-stays.



RIGGING TOPGALLANT-MAST.

53. Send the topmast down ?

Reeve the mast rope through a block at the lowermast head, through the sheave-hole in the heel of the mast, and make it fast at the other side of the mast head, come up all the gear, (backstays, rigging, and topmast stay), sway a little to get the fid out, then lower away, surge quickly just before the crosstrees come on to the lowermast head, send down all the gear with girtlines, single the mast rope and lower the mast on deck.

54. How would you send a topgallant-mast down ?

The same way as the topmast.

55. How would you send a jib-boom out ?

Reeve the heel rope through a block at the bowsprit cap, through the heel of the boom and make it fast at the other side of the cap; overhaul the fore and aft stays, back ropes and guys, make the flying-jib halyards fast at the end of the boom to keep it from dipping; heave away until the boom is far enough out, then down with the heel, clamp it, and lash a preventer round the heel of the boom and bowsprit.

56. How would you get the heel down?
With a spanish windlass.

57. What would you do next?
Set up the backropes, then the stays and guys.

58. Send the jib-boom in?
Reeve the heel rope the usual way, and come up all gear; make the flying jib halyards fast to the end of the boom; heave out a little to get the heel clear, then get a tackle on to the heel and heave the boom into its place; haul all the gear hand tight and frap along the boom.

59. Send down a topgallant-yard blowing hard?
Unreeve the tie, reeve the yard-rope through the sheave-hole at the masthead, take a hitch round the lee quarter and make the end fast round the weather quarter of the yard, clear the yard of buntlines, clewlines, leechlines, and the foot-ropes from the after side of the mast; lash a preventer parral round the yard and mast to keep the yard to the mast until ready for lowering away, sway away a little, unparral the yard, take the lifts off, top the yard and stop the yard-rope to the lee yard arm, lower away abaft all and to windward, sliding down the other part of the yard-rope or steadying the yard down with a tripping line, take the braces off as the yard comes down.

60. Send a topsail yard down blowing hard?
Send it down the same way as the topgallant-yard; if the yard is very heavy use a double purchase.

61. Send up a topgallant yard?
Reeve the yard rope (abaft everything and to windward) through the sheave hole at the mast head overhaul down to the deck and make fast about the middle of the yard, and stop it to what will become the lee yard arm. See all gear on the yard and heave away; when high enough shackle on the braces, heave away again towards the mast head, cast off yard arm stop and put on the lifts, parral the yard, then let the yard take the lifts and haul tight the braces, after which the halyards and other gear will have to be rove.

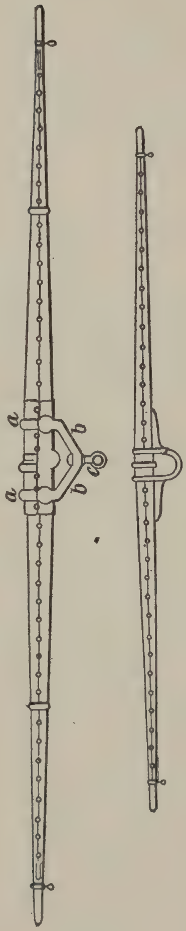


Fig. 41. LOWER AND UPPER YARDS.

a a Truss Hoop. *b b* Truss. *c* Swivel Bolt.

62. Send up a topsail yard?

Similar to the topgallant yard; if the yard is heavy use a double purchase.

63. Send up a main or fore yard?

Lay the yard athwart the deck, resting on the bulwarks; see all necessary gear on the yard including braces and foot ropes; reeve a good purchase from the lowermast head, or better still—from the topmast head. Hook the lower purchase block to the middle of the yard, and reeve a whip through a block at the fore side of the yard; lead this whip well forward. Heave away on the purchase and keep the yard horizontal with the lifts or with a line on each yard arm; when high enough, steady the yard into position with the lifts, braces and whip which is leading well forward. Shackle on the slings and truss the yard.

64. How are topgallant and royal yards rigged?

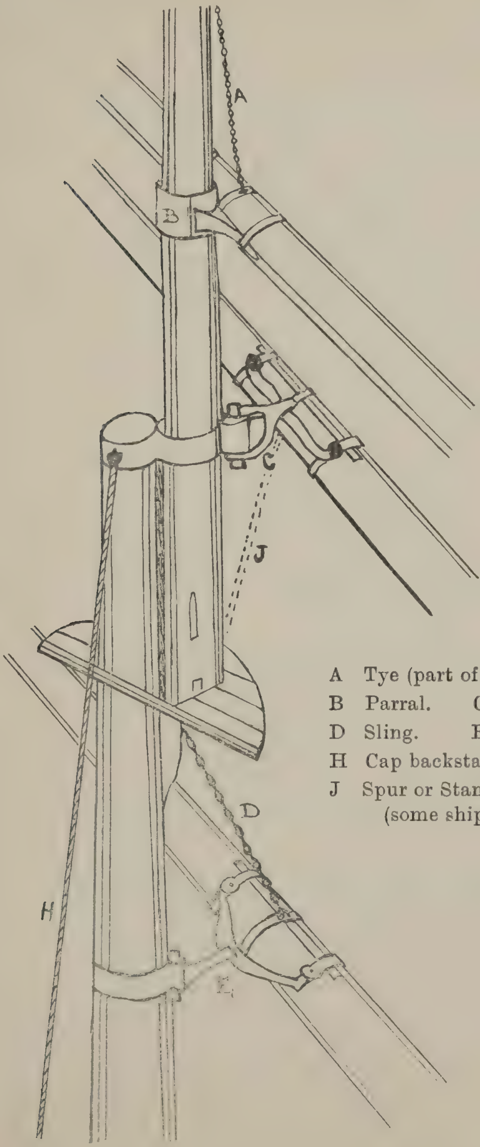
At the yard arms, iron hoops with eye bolts to hook or shackle the lifts, braces and footropes; along the top of the yard a jackstay to bend the sail to; at the middle of the yard—parrel and eyebolt to shackle halyards to. There are also clewline blocks at the yard arms (some have them at the quarter of the yard), and on top of the yard blocks or lizards for buntlines and leechlines.

65. How are the other yards rigged?

They all have the iron bands (or something equivalent) with the eyebolts, at the yard arms, to shackle the lifts, braces and footropes, also the jackstay, clewline and buntline blocks or lizards.

TRUSSES, SLINGS, AND PARRAL.

Fig. 42.



A Tye (part of Halyards).
B Parral. C Truss.
D Sling. E Truss.
H Cap backstay.
J Spur or Standard.
(some ships.)

The upper topsail yard is fitted with a parral, but the lower topgallant, lower topsail, and the fore, main and cross-jack yards are trussed.

66. How are the lower yards supported ?

Slings, truss and lifts.

67. Lower topsail yards ?

Truss. In addition to the truss, some lower topsail yards have an iron spur or standard J (Fig. 42) others have a crane. A lower topgallant yard is also supported by the truss.

68. How are the other yards supported ?

By the lifts and halyards. All yards that hoist are fitted with a parral, lifts and halyards. The lifts and halyards take the weight when the yard is down, and the halyards when the yard is up.

MANAGEMENT OF A SHIP UNDER CANVAS.

(Note.)—A ship under close-reefed topsails is equivalent to a ship under lower topsails.

1. The ship is under reefed topsails and courses with the wind a point abaft the beam and a heavy squall to windward, what would you do first ?

Haul the mainsail up, and keep her before the wind, then take the sail off her.

2. Under reefed topsails, foresail, jib, fore topmast staysail, and main trysail, which would you take in first ?

The trysail.

Note.—Most ships now have staysails in the place of the trysail.

3. How would you bend a foresail, blowing hard ?

Stretch the sail across the deck, bend on the buntlines, leechlines and clewlines ; reef the sail by the foot, tie stops right round the sail about every two feet, leaving the head outside ; hook on the reef-tackles and stop the buntlines and leechlines to the head of the sail ; then haul away on all the gear until the sail is snugly under the yard ; pass a few slack turns with the gaskets, make the midship stop fast, haul out the earings, tie the robands and stow or set the sail as required.

4. How would you reef a topsail?

Lower the yard, haul in the weather topsail brace, and check the lower yard; haul out the reef tackles (if any), steady tight the halyards and lay aloft; haul out the earings and tie the points, slack away the reef tackles, let go lee brace and hoist the yard tending the weather brace as the yard goes up.

5. Blowing hard, the wind two points abaft the beam, you want to reef main and fore topsails, which topsail would you reef first?

I should keep the ship before the wind, and reef the fore-topsail first.

6. At what time would you swing your main yard, staying a ship?

With the wind about a point on the weather bow.

7. What time the foreyard?

When the main yard is full, and I think the fore yard will fill.

8. You are running with the wind three points on the starboard quarter, blowing hard, and it suddenly shifts round on the port quarter, what would you do?

Hard a port, turn the after yards round and then the fore.

9. If you were on the port tack, with the wind two points abaft the beam, and it suddenly shifts to four points on the starboard bow (caught aback on lee bow), what would you do?

Brail in the mizzen, square the after yards. and keep the fore yards aback to box her off; when she pays off, haul the head yards round, and trim the sails.

10. If you were close hauled on the starboard tack and caught aback right ahead; get the ship on the same tack?

Hard up the helm; flatten in the head sheets; box the fore yards and brail in the mizzen. If she fell off with the wind on the port bow, it would then be best to let her come round on her heel. (See Question 38.)

11. The wind increasing, how would you begin to reduce the sails in a full rigged ship?

I would first take in the royals, flying jib, small staysails, and then top gallant sails.

12. Go on—the wind still increasing?

I would reef each topsail.

13. The wind still increasing, what would you do next ?

I would close reef the fore and mizen topsails, reef the courses, and stow the mizen.

14. Go on—the gale still increasing, with a strong sea running ?

I would reduce to three lower topsails, reefed foresail, and fore topmast staysail, carry them as long as the ship and masts could bear them without injuring either, in order to keep steerage way on the ship. I would have the helm well attended to, easing it down to the pitching of the ship.

15. If you have reduced to two lower topsails, and the ship will not carry them ?

Stow the fore one, afterwards the main one, and set a storm trysail or staysail.

16. The gale being at its height, and a very heavy sea running, the ship labouring very hard, could you do anything to ease her ?

I would have the helm strictly attended to, and not lashed to leeward, as is often done. By carefully watching the action of the seas and motion of the ship she may be eased greatly when contending against a heavy sea.

17. Is there anything you could do before the gale is at its height ?

Send down royal and topgallant yards.

18. Which is the best way to send them down ?

I would send them all down to windward, bending a line on the lower yard arm to steady them while being lowered, or slide them down the yard rope.

19. Suppose the storm staysail blew away ?

Lash a tarpaulin in the mizen rigging.

20. Your rigging has become slack, what would you do ?

Lash a spar outside the rigging on both sides, then pass a rope from one side to the other between each shroud, and bowse well tight.

21. Suppose the vessel broke off, what would you do ?

Wear her.

22. Why would you wear her ?

The vessel breaking off would bring the sea more on the beam, causing her to labour more heavily, and is often attended with great danger. The more a vessel can be kept end on to the sea, the easier she will bear its fury.

23. How would you wear her with only the storm trysail set?

If possible, I would set the lower fore topsail and staysail, take in the trysail, and put the helm hard up, ordering the crew from the deck till the vessel was before the wind. I would then brace round the after yards, clue up the fore topsail, lay the fore yards forward, but not sharp up, ready for stowing the sail, down fore topmast staysail, and as she draws the wind on the quarter, set the trysail or storm staysail again, keeping the crew as well sheltered as circumstances would permit until the ship comes to the wind, then stow fore topsail and staysail as quickly as possible.

24. Why would you send the crew from the deck?

In a heavy sea-way there is great danger in a vessel going off, and likewise in coming to the wind; should a sea strike her at such times, it must always of necessity sweep something away, and no prudent officer will expose his crew more than is absolutely necessary.

25. Weather moderating, what sails would set first?

I would set the three lower topsails, reefed foresail and fore topmast staysail.

26. Go on setting the sails, the wind still moderating?

I would set the three upper topsails, jib and lower staysails, mainsail and mizen; then shake out all reefs and set the upper sails.

Note.—The square sails are usually "taken in" in the following order:—mizen royal, fore royal, main royal, mizen topgallant-sail, fore topgallant-sail, main topgallant-sail, mizen upper topsail, fore upper topsail, mainsail, main upper topsail, foresail, lower mizen topsail, lower fore topsail and lower main topsail. The crossjack is usually taken in after the upper sails.

The same sails are generally set in the reverse order to taking them in.

27. You are running with the wind on the starboard quarter, and it shifts suddenly round to the port beam with a hard squall, what would you do?

I would haul in the starboard fore braces, and fill the head yards; shiver the after yards, putting the helm hard a-port, brail in the mizen, and let her go off before the wind until the sails were reduced sufficiently for the ship to bear them.

28. In staying, suppose your ship paid right off before the wind how would you act ?

I would keep the fore yard square until she came to, then trim it.

29. How would you haul the jib down ?

Keep the ship off a few points ; let go the halyards ; man the downhaul, easing off the sheet as the sail comes down.

30. How would you reef a course ?

Hook a reef pennant on to weather clew and haul tight the lifts, haul the sail up the same as for stowing (not right up), then haul out the reef-tackles, lay aloft, haul out the earings and tie the points ; then slack away the reef tackles and set the sail.

31. You are nearing your port of destination (by your reckoning) in foggy weather, when would you bring your ship to an anchor ?

When I found by the lead that the water shallowed to a prudent depth.

32. How would you put your ship about ?

Give the order, "*About Ship.*" See all clear, the hands at their respective stations, ease the helm down and haul the

PUTTING SHIP ABOUT.

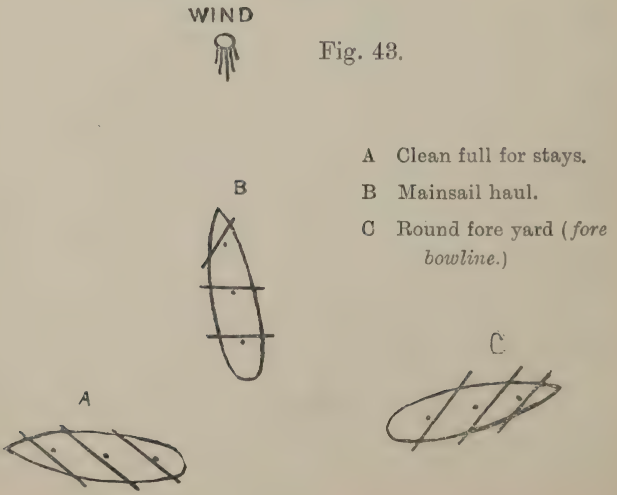


Fig. 43.

A Clean full for stays.
B Mainsail haul.
C Round fore yard (*fore bowline.*)

mizen boom amidships. "*Helm's a-lee*"; then, as she comes to and shakes, "*Tacks and sheets*"; and when within one point of the wind, "*Mainsail haul*"; down main tack and aft sheet; trim the head sheets and shift the helm, if necessary; when round far enough for the head yards to fill, "*Let go and haul*" down tack and aft sheet, brace the yards and haul out the bowlines. (See questions 6 and 7).

33. How would you tack a lazy ship?

Keep her clean full for stays; when the sails shake, ease the lee fore brace to back the fore yards suddenly, and haul the mizen boom amidships.

34. How would you put the ship about with only the watch?

I would hook my tack tackles on the lee side ready for boarding the tacks when round, raise the clews of my courses, and then proceed as with all hands.

35. In staying, what is to be particularly noticed?

If the ship gathers stern-way, to shift the helm.

36. Wind on the port quarter, the weather main-topgallant brace gives way and also the parral, what would you do?

Masthead the yard and bring the wind on the starboard quarter so as to bring the yard gently aback against the mast. Then secure it.

37. Suppose your ship missed stays, what would you do?

Let her come round on her heel.

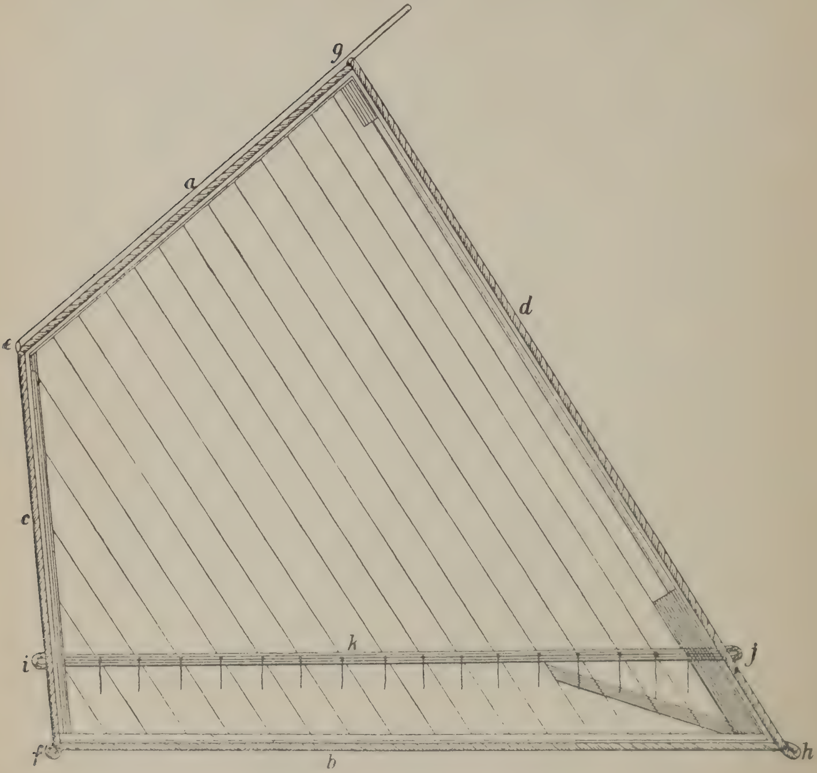
38. How would you do it?

As the ship will have sternway, I would shift the helm a-lee again, square the after yards, haul the head sheets aft and brail in the mizzen. When she gathers headway I would shift the helm a-weather and shiver the after yards; when before the wind square the fore yards, and when she gets the wind on the other quarter, haul out the mizzen and brace the yards up as the ship comes to.

39. How would you wear a ship with ordinary canvas set, all light sails in?

Brail in the mizzen, hard up the helm, and as she goes off, square in the after yards, keeping them just on the shake; when before the wind, square the fore yards and brace them up for the other tack; then as the ship is coming to brace up the after yards and set the mizzen.

TRYSAIL OR MIZZEN.



a Head-rope.
b Foot-rope.
c Fore leech rope on luff.
d After leech rope.
e Throat.
f Tack.
g Peak.
h Clew.
i & *j* Reef cringles.
k Reef-band.

e, f, g, h, i, & j are cringles with thimbles in them.

Fig. 44.

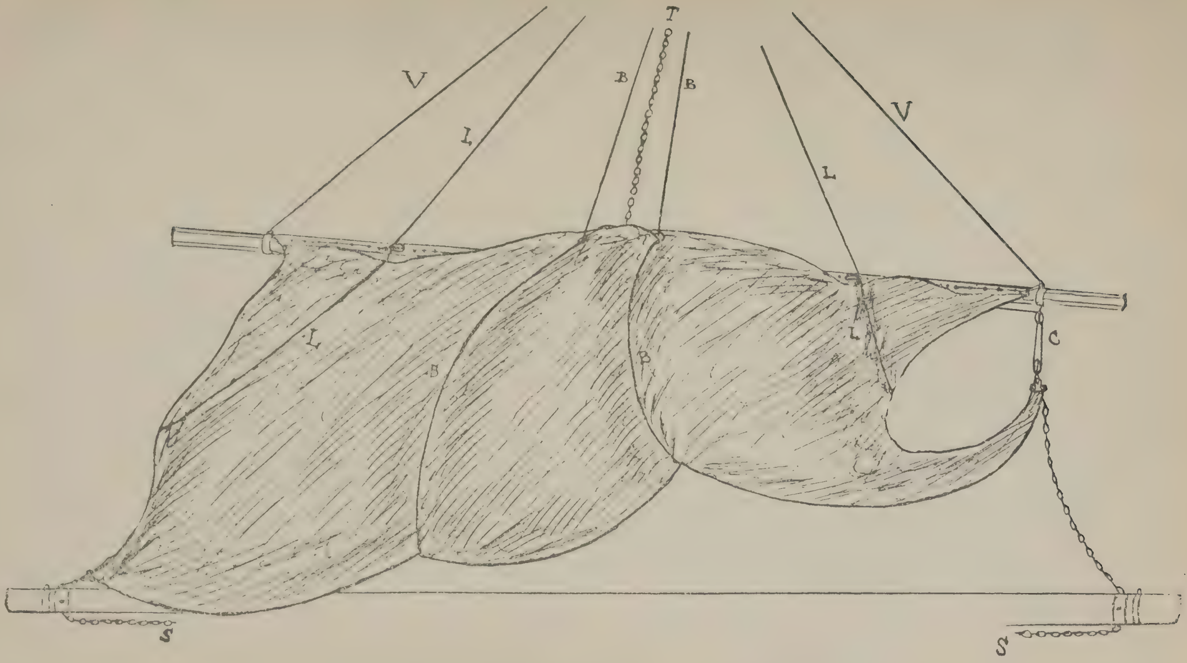
40. How would you take a topgallant sail in?

Clew down the yard, check the weather brace, haul up the lee clewline, buntline, and leechline, then the weather gear and stow the sail.

The royal is taken in, in a similar way.

Fig. 45.

TAKING IN A TOPGALLANT SAIL.



B Buntlines. C Clewline. L Leechlines.
S Sheets. T Tie. V Lifts.

41. How would you set it?

Loose the sail, overhaul the gear, haul home the lee sheet, then the weather sheet, hoist the yard, tending the weather brace, and haul tight the lee brace.

Set the royal the same way.

42. How would you take in the mainsail in a gale of wind?

Keep the ship well full; steady the lifts; ease off the lee sheet a fathom or so; man the weather clew-garnet, buntlines and leechlines; then ease away the tack and haul upon the clew-garnet, and buntlines; the tack being close up, man the lee clew-garnet, buntlines and leechlines; ease away the sheet, and haul upon the clew-garnet, buntlines and leechlines. This sail, as well as the foresail, is often taken in by means of spilling lines.

N.B.—Some captains prefer the lee sheet hauled up first; but it shakes the sail more, consequently is more liable to carry the sail away.

43. How would you set a course?

Loose the sail, overhaul all gear, let go lifts, haul aft the slack of the sheet, down with the tack, and haul the sheet flat aft.

44. How would you set an upper topsail or upper topgallant sail?

Loose the sail, let go downhauls and sheets of the sail above, overhaul gear and hoist away on the halyards, tending the weather brace.

45. How would you take them in?

Lower away, haul on downhauls, take in slack of weather brace, haul on the buntlines or the spilling lines; steady tight the halyards and braces, placing the yard parallel with the lower yard, then stow the sail.

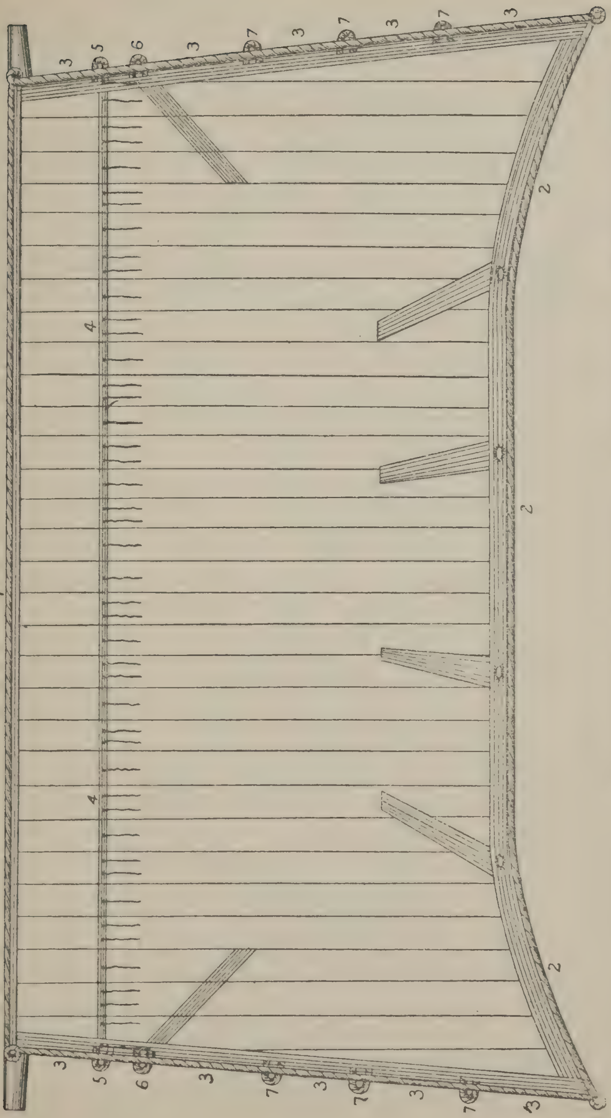
Note.—It is not usual to clew these sails up as the sheets are kept fast at all times. Some have no sheets, the clews being shackled to the lower yard arms.

46. Take in the mizzen?

Ease off the weather vang and boom sheet, haul down the head, slack away the foot outhaul and haul on the lee brails, taking in the slack of the weather brails.

Fig. 46.

COURSE.



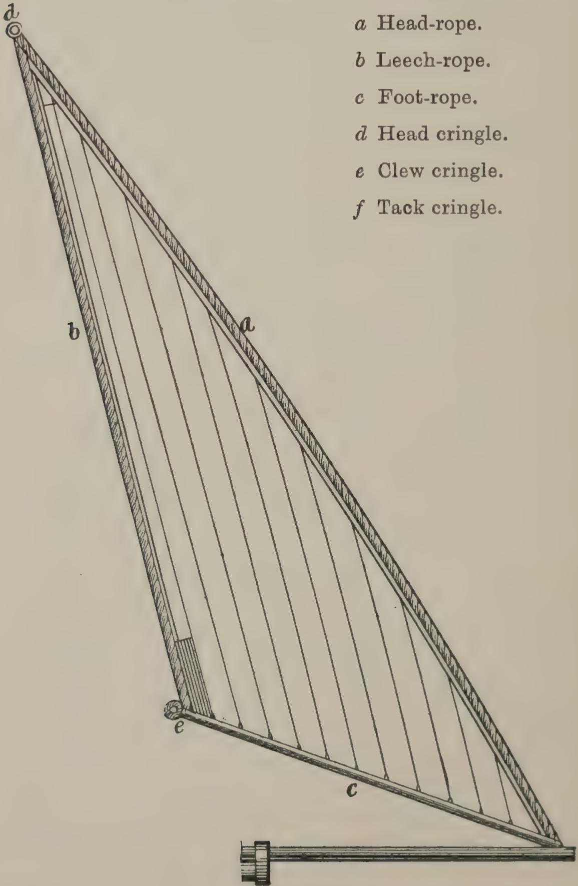
1 Head-rope. 2 Foot-rope. 3 Leech rope. 4 Reef-band. 5 Reef-cringles. 6 Reef tackle cringles.
7 Leechline & Bowline cringles The upper corners are Earing-cringles & the lower corners Clew-spectacles.

47. Set the mizzen ?

Ease off the weather vang and boom sheet, let go the brails, haul on the foot outhaul, then haul on the head outhaul and when the head is full out, give another pull on the foot outhaul and trim the sail.

48. Set a jib ?

Loose the sail, haul aft sheet, let go downhaul and



a Head-rope.
b Leech-rope.
c Foot-rope.
d Head cringle.
e Clew cringle.
f Tack cringle.

Fig. 47. JIB.

hoist away on the halyards, tending the sheet, and when set, trim the sail.

49. How would you shake out a reef?

Haul the reef tackles well tight. Ease the tack and sheet of a course; settle the halyards and haul tight the downhauls for a topsail. Each man must commence at the middle of the yard, loosing the points, working outwards towards the yard arms. The earings are eased off together, reef tackles let go and the sail set the usual way.

50. What would you do after unbending sails?

See them tallied and repaired before stowing them in the locker.

QUESTIONS RELATING TO STEAMSHIPS.

1. A steamship under the spouts, or against a wharf, what precautions would you adopt?

Have fenders over the side to prevent chafe. Have a bow and quarter spring to the shore to secure her.

2. In getting under weigh, what should be seen to before the engines are started?

Have a report from the engine room that everything is clear about the engines; see that there is nothing foul of the propeller; be very careful to haul in the slack of the quarter rope as it is eased off, for fear of the bight fouling the screw; and see that the wheel chains, leads and rudder are in perfect working order.

3. Describe any arrangement of limbers you know of?

The water-ballast tank is made flat on its top till it approaches the sides, when it is made to curve down, thus forming a gutter at each side.

4. What are they for?

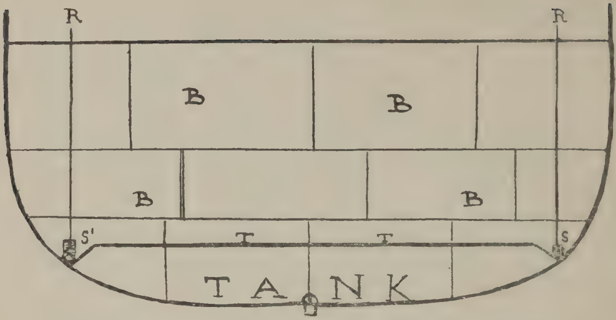
To allow any water that leaks in to find its way to the engine room bilges, where it can be pumped out.

5. How can it pass the bulkheads?

There are sliding doors (called sluice valves) worked from the deck, which, on being opened, allow the water to pass through on its way to the pumps.

(Modern ships in lieu of sluices, have pipes with strum boxes at the ends, leading from each hold direct to the engine room.)

SLUICES.



R Sluice Rod. S¹ Sluice open. B Bulkhead.
T Tank Top. S Sluice open.

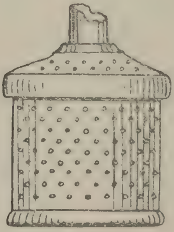
Fig. 48.

6. How often do you open sluices ?
Every day.

7. What are strums ?

Perforated boxes to keep any dirt from getting to the pumps.

Fig. 49.



STRUM BOX.

8. How do you clean out the limbers ?

By hand when possible. If the hand will not reach, then by a tin fastened to a rod. The limbers should be limed or white-washed after cleaning.

9. What are the advantages of water-ballast tanks ?

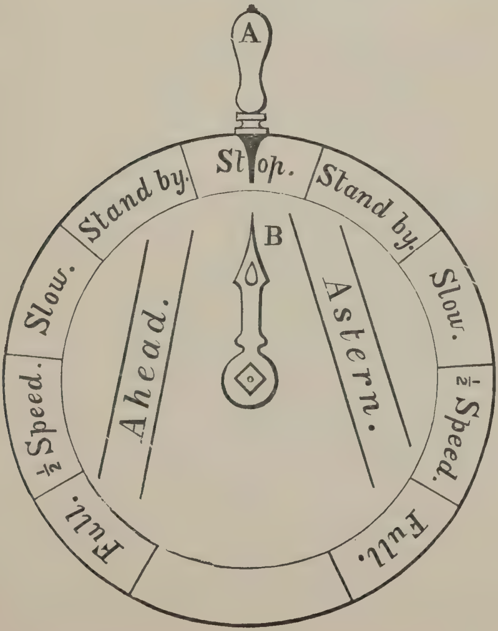
A ship when being moved from one port to another in ballast saves the expense of buying and loading ordinary ballast, the expense of discharging it, and the loss through detention in both operations; because she opens her water ballast cocks and allows the water to run in as she goes along; and as she is reaching her port she begins to discharge it through her donkey ballast pump. They should be always full; if not, she is liable to list.

10. Describe an engine room telegraph?

In the following sketch the handle A is worked by the officer of the watch, who moves it towards his left side for going ahead, and towards his right hand for going astern. The vertical position is "stop," and the other orders are "stand by," "slow," "half speed," and "full."

The pointer B is the repeating signal, and is worked from the engine room thus:—The officer on deck puts the handle A at "$\frac{1}{2}$ speed" to the left; this motion causes a bell to ring in the engine room; upon this the engineer looks at his dial and sees the pointer at "$\frac{1}{2}$ speed," he then moves his handle to the same, and this movement causes B to move round to "$\frac{1}{2}$ speed" ahead, thus showing the officer of the watch that his order is perfectly understood.

Fig. 50.



11. Prepare a steamship for sea?

See that there are no warps foul of the propeller; everything securely lashed and hatches properly battened down; no iron near the binnacles; steam whistle all right; telegraph all right; try the steam steering gear over each way; see that the hand gear is ready for shipping; and that the wheel chains are clear; log and lead line ready; all lights trimmed, and the water drained out of the cylinders of the winches.

12. How do you drive a steam winch?

Open the drain cocks; stand with one hand on the throttle valve, the other hand on the reversing lever, and a foot near the brake.

13. You have charge of the deck of a steamer at sea, and a cry is raised of a man overboard on the port bow; what is the first order you would give, and why?

Starboard. To give the man a chance of clearing the screw.

14. Making land in dense fog?

Have the ship eased down to *slow;* keep the lead going and double the look-out.

15. Repair link in wheel chain?

Ship the hand gear, and repair with a connecting link.

16. One of the steering rods is broken?

Ship the hand gear, and repair with a spare rod, or a length of chain or wire.

17. The steam pipes on deck are frozen?

Build fires round them, or place hot fire bars at each side.

18. What flag does a pilot boat fly while on pilotage duty?

White and red (horizontal).

19. How must a lifeboat be equipped?

A full complement of oars and two spare ones; two plugs for each plug hole, attached with lanyards; one set and a half of thole pins or crutches, attached with lanyards, sea anchor, baler, rudder and tiller or yoke lines, painter, boat-hook, vessel kept filled with fresh water, two hatchets attached with lanyards (one at each end), mast and sail, life line round the outside of boat, efficient compass, one gallon of vegetable oil, and a vessel for distributing it, and a lantern trimmed with oil to burn eight hours.

20. What would you have ready going alongside quay?

Warps, fenders and heaving lines.

SCREW RACE.

1. What is meant by a right-handed screw propeller?

One that revolves from the port to the starboard side of the ship during the upper part of its revolution while the ship is moving ahead, and the propeller is being looked at from aft, forward.

2. What is meant by a left-handed screw?

One that revolves from the starboard side to the port side under the same conditions as in the last.

3. What effect has a right-handed screw on a ship going ahead?

It tends to send her to the port side of her course, the effect being as if she carried a starboard helm.

4. What effect has a right-handed screw upon a ship going astern?

To throw her to starboard of her course.

5. What effect has a left-handed screw upon a ship going ahead?

To throw her to starboard of her course.

6. What effect has a left-handed screw upon a ship going astern?

To throw her to port of her course.

7. How would you turn a steamship short round with a right-handed propeller?

Hard a port and give her a few turns ahead; when far enough ahead, stop her, and come astern; when she gathers stern way, shift the helm; when far enough astern go ahead again and so on till she is round.

8. There is not sufficient room to go ahead and astern?

Drop the anchor and steam round it with the helm hard over, paying out just sufficient cable for the anchor to hold.

9. There is not sufficient room to steam round the anchor?

Place her bow against the bank or quay and heave her round; the wind or tide might be favourable to swing her round.

10. Which end of a ship does the rudder move?

The stern; when the helm is put over to starboard, the stern goes to port, and when put over to port, the stern moves to starboard.

VENTILATION.

1. What general direction does the air between decks take ?

It takes the opposite direction to that of the wind. The more the ship is battened down the more sure is this rule.

2. Where should ventilators be put ?

There should be two at least, one forward and one aft, for each hold.

3. Which would be the uptake ?

The weather one for the time being.

4. Are the ventilators protected ?

Yes, with cowls.

5. Under what conditions are coal cargoes most dangerous, that is, most liable to spontaneous combustion ?

When the coal is subject to breakage during transport from pit to ship, when coal which is pyritic is shipped in a wet condition ; and especially when the ventilation is through the body of the coal cargo.

6. In fine weather what would you do with such a cargo ?

Keep the hatches off, whenever possible.

7. What precaution should always be adopted with coal cargoes during long voyages ?

The temperatures of the various portions of the cargo should be tested periodically by thermometers, and registered in the log.

8. Besides the hatches, what other means must be adopted for relieving the gases from the surface ?

There must be ventilators giving *free* and *continuous* egress to the open air in all states of the weather.

9. In ventilating the 'tween decks of an emigrant ship, what is most to be guarded against ?

The down draught, giving cold to the people.

MATE'S DUTIES, AND SEAMANSHIP.

1. What would you do on first joining a ship ?

Report myself to the master, if he is on board.

2. And then ?

I should have a general overhaul of all standing and running gear, especially every part that is liable to be chafed. I would have the chafing mats off, and renew them where necessary. If there is time rouse up the chain cables, and see that the ends are properly stoppered, and that there are no faulty links nor worn shackle bolts.

3. Your ship is loaded; what would you be sure to see to before going to sea?

That the hatches were properly secured, the pumps in good order, and the lead line is all right (ques. 4. p 14).

4. Where would you be stationed in going to sea?

At the bows.

5. What for?

To let go an anchor at a moment's notice, if required.

6. What would you do before letting go a patent anchor?

Slack it out a little to make sure of it starting.

7. How would you make a lee side for a lighter?

Clap a spring on the cable from the quarter and slack away the cable until the ship's head pays off enough.

8. You are in a tender ship (without ballast tanks) and are nearly discharged, what would you be careful about?

Keep in sufficient cargo for stiffening and take in part of the loading cargo before finishing discharging. In some docks ballast booms are to be had, which placed on each side (floating) with chains hauled tight from the ship, keep her upright, and enables one cargo to be discharged before starting to load the next.

9. At sea, if a gale has been blowing for the last three or four days, and now has passed off, what would you do?

Examine everything aloft to see that nothing has chafed, &c., and sound the pumps.

10, Taking in cargo from lighters; the lighters come off irregularly; what would you do?

Note the time that one finished, and the time the next commenced.

11. What would you do on receiving the goods from the lighter?

I would keep tally, and if all is right I would sign one of the boat notes brought off by the man in charge, and keep the other.

12. If you were discharging cargo into a lighter?

Get a receipt from the man in charge of her.

13. If any goods should be sent off to you in a damaged state?

I should call the captain's attention to them before giving a receipt, and he would use his own judgement about receiving them.

14. Riding in an ordinary case, at slack water, there is no wind, what would you do?

Heave dead short.

15. If you have been below all night, how could you tell in the morning if your anchor were fouled?

Only by sighting it.

16. What is the principal rule in casting a ship?

Always cast her towards the danger, if possible.

17. How would you carry out a stream anchor?

Hang the anchor to the stern of the boat by the ring in the same manner as it is hung at the cat-head, pass a shank painter under one of the flukes, and lead the two parts forward to about the midships of the boat. Place the chain or wire in the bows.

18. How would you moor with two anchors and forty-five fathoms of chain?

Drop the working anchor first, and pay out 90 fathoms of chain, then let fall the bower; throw all aback. heave in on one chain, and pay out the other till there are 45 fathoms of each out.

Another plan is:—Let fall one anchor and throw all aback; pay out 90 fathoms and let go the second anchor; heave in on the first cable and pay out on the second, till there are 45 fathoms of each out.

The same way for a steamship with the exception of throwing aback, as she can work under her own steam.

19. How would you pick them up again next day?

Pick up the lee one first.

20. How would you cast your ship in getting under weigh?

If to Starboard—Haul on my port fore braces, and let my after-yards lie square. I may hoist the foretopmast staysail, and keep the sheet to windward, to help her.

If to Port—Haul in the contrary braces. When cast, fill the head sails and brace up.

21. You want to get under weigh; you are hove dead short, wind on the bow, there is a rock right aft; what would you do?

Give her a broad sheer, back everything, and let her dredge.

22. Supposing there was no wind, tide right ahead?

Give her a broad sheer, and let her dredge.

23. Riding in a bay, wind and sea rising and coming right in; you want to slip and get out to sea; how would you cast her?

Trim the yard for the tack I am going to sail out on, set topsails and a few fore and aft sails, have other sails loosed and ready for setting; get a spring (good warp) from what will be my weather quarter and make fast to the cable below the hawse pipe, haul the spring tight and make fast, slack away the cable when sure she will pay off the right way; when she fills, slip cable and spring (have them buoyed) and set the other sails.

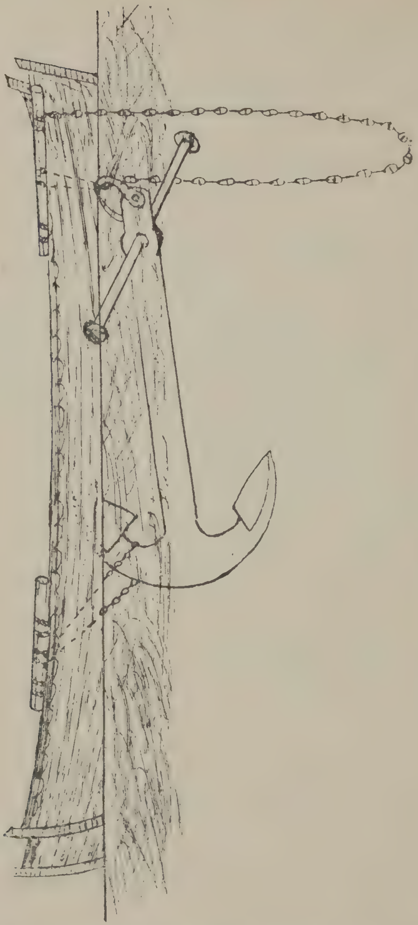
24. Whenever you have to slip from a cable what would you do?

Buoy the cable and spring, they can then be picked up when the weather moderates.

25. How would you carry a bower anchor out, also 90 fathoms of chain?

Lash a spar across the gunwales of two boats, leaving space between the boats for the fluke of the anchor, lower away the anchor from the ship, hang the upper fluke from this spar, lash another spar across the after part of the boats and hang the head of the anchor from this spar; the anchor is now placed with the flukes (vertical) and shank (horizontal) between the boats and the stock (horizontal) under the sterns of the two boats, lower as much chain into the boats as they will safely carry, haul the boats off by means of a warp made fast to a kedge which has been previously run away, pay out enough chain to let the anchor reach the ground, then let go both slings together; the boats can now be unlashed, and as one boat is paying out chain, the other boat will be going off to the ship for more.

Fig. 50.

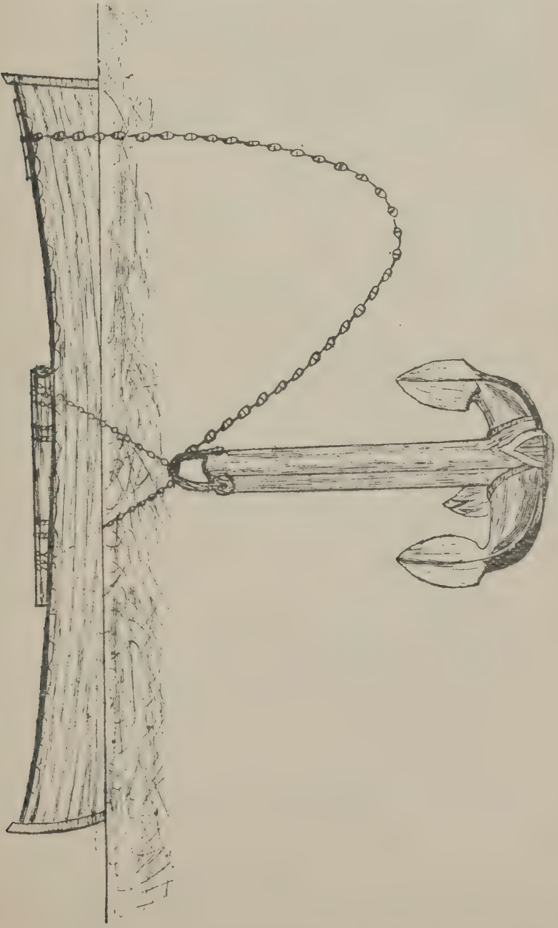


CARRYING OUT ANCHOR WITH 2 BOATS.

26. How would you carry a bower anchor out with one boat?

Lash a good spar across the middle of the boat with the ends projecting over the gunwale at each side, lower the anchor from the ship into the water with the ring or shackle at the surface; place the boat over the anchor and reeve a good rope, wire or chain through the shackle and make fast round each end of the spar, hauling well tight, lower away from the ship and let the boat take the weight of the anchor; slack away the first length of chain into the boat and haul off to a kedge that has been previously run away. Pay out sufficient chain to allow the anchor to reach the bottom, then let go the anchor, and haul back to the ship paying out cable; if there is not sufficient chain to reach the ship, buoy

Fig. 51.



CARRYING OUT ANCHOR.

the end and go back for more, or if you have hands enough, send off the required cable in another boat.

27. How would you protect the gunwale when paying out chain.

Lash a spar over it, to slide the chain over.

28. You are lying close to a river bank or a sloping breakwater; it is blowing a gale right on the off side of your ship; you have an anchor broad off from the bow and another broad off from aft to keep the ship off the bank side; the anchors will not hold, what will you do?

Boom her off from the shore with stout booms, one from the bow and another from the quarter.

SHIP'S LOG.

1. What entry would you make in your log after anchoring?

The time, depth of water, which anchor is down, how many fathoms of cable are out, and bearings of two fixed objects.

2. What entries would you make day by day at sea?

The courses steered and distances run, winds and weather, latitude and longitude by observation and dead reckoning, sail made or taken in, and generally the work done by the crew, *and name how many inches of water you found in the pump well, and that you pumped it out*, also any damage the ship may have received.

OFFICIAL LOG.

What entries are made in the Official Log?

Births, deaths, marriages, convictions, punishments, fines, forfeitures, illness of any of the crew, character and conduct of each member of the crew, collisions, &c.

Directions from Official Log Book in the Home Trade.

1. All ships, of whatever tonnage, except those trading exclusively between Scottish ports, must carry an Official Log Book.

2. The importance of keeping the Log properly and duly making all the entries at the proper time, and with the strictest regard to form, cannot be too strongly impressed upon

ship Masters. By neglecting to do so they subject themselves to heavy penalties, and their owners to serious loss and inconvenience.

3. Every entry is to be made as soon as possible after the occurrence to which it relates, and if not made upon the same day as the occurrence to which it relates, shall be made and dated so as to show the date of the occurrence and of the entry respecting it.

4. The following offences in respect of Official Log Books shall be punishable as hereinafter mentioned: that is to say—

- *a.* If in any case an Official Log is not kept in the manner hereby required, or if any entry hereby directed to be made in any such Log Book, is not made at the time and in the manner hereby directed, the Master shall for each such offence incur the specific penalty herein mentioned in respect thereof, or where there is no such specific penalty, a penalty not exceeding five pounds.
- *b.* Every person who makes or procures to be made, or assists in making any entry in any Official Log Book in respect of any occurrence happening previously to the arrival of the ship at her final port of discharge more than 24 hours after such arrival, shall for each offence, incur a penalty not exceeding thirty pounds.
- *c.* Every person who wilfully destroys or mutilates, or renders illegible any entry in any Official Log Book, or who wilfully makes or assists in making or procures to be made any false or fraudulent entry or omission in any such Log Book, shall, for each offence be deemed guilty of a misdemeanour.

5. The Master, Owner, or any of the crew, of any British ship shall transmit or deliver the Official Log Book for the preceding half-year to some Superintendent in the United Kingdom.

6. The following are the entries required by law to be made upon the sixth, seventh, and eighth pages of the form—

- *a.* Conviction of any Member of Crew and Punishment. (*Sect.* 240 *of M.S. Act*, 1894.)
- *b.* Offence committed by member of crew for which it is intended to prosecute or to enforce a forfeiture, or to exact a fine, together with such statement concerning

the reading over such entry, and concerning the reply (if any) made to the charge as hereinbefore required. (*Sect.* 240 *of M. S. Act*, 1894.)

c. Offence for which the punishment has been inflicted on board, and the punishment inflicted. (*Sect.* 240 *of M. S. Act*, 1894.)

d. Illness or injury that has happened to any Member of crew, the nature thereof, and the medical treatment adopted (if any). (*Sect.* 240 *of M. S. Act*, 1894.)

e. Marriage that has taken place on board, the names and ages of the parties. (*Sect.* 240 *of M. S. Act*, 1894.)

f. Amount of Wages due to any seaman who has entered His Majesty's Service during the Voyage. (*Sect.* 240 *of M. S. Act*, 1894.)

g. Wages due to any seaman or apprentice who has died during the voyage, and the gross amount of all deductions to be made therefrom. (*Sect.* 240 *of M. S. Act*, 1894.)

h. Statement of the amount of money and description of the effects left by any seaman or apprentice who has died during the voyage, including a statement of each article sold and of the sum received for it. (*Sect.* 240 *of M. S. Act*, 1894.)

i. Collisions with any other ship, and the circumstances under which the same occurred. (*Sections* 240 and 423 *of M. S. Act*, 1894.)

j. Change of Masters—List of Documents handed to new Master. (*Sect.* 258 *of M. S. Act*, 1894.)

7. On every occasion of the Vessel proceeding to sea, the Master is required, under a penalty of £20, to enter in the Official Log Book the ship's draught of water.

8. Every Birth and Death happening on board is to be entered in accordance with the directions upon pages 4 and 5.

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9. Where is the ship to be marked so as to show her draught?

On her stem and on her stern post, in Roman capitals, or figures six inches in length.

10. The Merchant Shipping Act requires another entry to be made, what is it ?

The amount of clear side.

11. Where are you to measure the clear side ?

From the lowest part of the upper side of the deck.

12. How are you to measure it ?

Measure from the top of the rail to the water outside, and from the top of the rail to the deck inboard ; the difference is the amount of the clear side.

DANGERS AND NAVIGATION OF THE ENGLISH CHANNEL.

On approaching the Channel from the Atlantic, your Captain is too ill to work the ship ; the whole responsibility rests on you.

1. In what parallel of latitude would you make the Channel ?

From 49° 15′ N to 49° 30′ N.

2. Why ?

Because by making the Channel to the North of this I might be carried to the Northward of Scilly by the current setting NW athwart the entrance to the Channel, and the tides running nearly nine hours to the Northward, and only three hours to the Southward.

3. Suppose you had to heave your ship to behind the Scilly Isles ; how would you do it ?

With her head to the South to stem this set.

4. What soundings do you get in the fairway of the Channel ?

Fine sand, small yellow stones with black specks, and broken shells, with 50 to 60 fathoms of water.

5. What is the course up the Channel ?

East by South, paying due attention to the deviation of the compass.

6. On making the Channel in thick weather, how do you know when you are to the Northward of the fairway ?

By taking a cast of the lead, and finding that the water is shoaling, with oazy bottom.

7. What is the best guide to the navigation of the Channel after the lights?

The lead, if continuously used, as the soundings may generally be depended upon.

8. How do you know when you are approaching the French coast?

By finding deeper water, with coarse stones and red sand.

9. How far would you think yourself justified in proceeding up Channel without making the land?

To the Start.

10. On which side of the Channel would you keep?

The English side.

11. Why?

Because it is not so encumbered with dangers, the tides are more regular, the currents are not so strong, and there are more and better barbours to run for in case of distress.

12. If you are not certain of your position when making the Channel, what should you depend upon?

The log, lead, lookout, and quality of the ground.

13. Suppose you make the Channel in thick weather, and you have not taken the Sun for the last two or three days, what would you do?

Take a cast of the lead about every two hours, and more frequently when I get closer into the land.

14. Which would you prefer; to go by the time since you took the last sounding, or the distance shown by a patent log?

The distance shown by the log.

15. Supposing you have brought your ship up Channel as far as the Meridian of the Start, still thick, and no land yet seen; what would you do?

Heave her to with her head to the North, keep the lead going, and put her about when I found the water shoaling dangerously.

16. Why with her head to the North?

The current tends to the French Coast.

17. Suppose it clears up, and a gale comes away from the SW, you got up to Dungenass at night; what would you do, supposing you were bound for London?

Take her into the North Sea at the back of the Sands, and heave her to between the North Sand Head and the Knock. In the morning run into Margate Roads.

LOSS OF BOWSPRIT, MASTS, &c.

1. You have sprung your bowsprit, what would you do?

Keep the ship before the wind under easy sail, and fish it with jib-boom and spare spars, using good chain lashings wedged well tight.

2. Suppose it is carried away at the knight-heads, how would you act?

I would immediately keep the ship away, reduce sail, take in all head sails, and save everything possible. Secure the fore topmast with a good rope or wire hawser, the middle of the hawser round the mast-head, and each end through the hawse-pipe set up to the windlass; send down fore topgallant and royal yards, also the mast, take in the jib-boom and repair. If the bowsprit cannot be fished, rig out one of the spare spars to replace it, or rig out the jib-boom similar to a billyboy's bowsprit.

3. The bobstay carries away, what would you do?

Hard up, and get the ship before the wind, reduce sail to ease the speed; if the bobstay is carried away about the middle, pick up the two parts, shackle them together and set up. If carried away at the stem, get a length of mooring chain, pass each end out through the hawse-pipes and shackle them to the heart where the bobstay sets up; take each part to the windlass and set tight.

4. Suppose your foreyard were carried away in running so that you could do nothing with it, what would you do?

Send down the main yard, and then send it up forward.

5. If you carried away your topmasts, what would you do?

If they were gone close at the cap, I would scarf them; they would then set the topsails with a single reef.

6. If they were broken into three or four pieces, what would you do?

It is most likely I should have one spare spar for a main topmast. I would take the jib-boom for a fore one and the mizzen boom for a mizzen topmast.

7. If you sprung a lower-mast, what would you do?

I would fish it with spare spars, sending down the top-gallant and royal masts, and all other things possible, to ease it.

8. Suppose your lower mast-head is getting rotten and the cap is working down; what would you do?

Make a spanish cap. Take rope or chain and wrap it round and round the lower-mast and top-mast underneath the cap. Fix the ends to a handspike and turn it round and round till I got the rope or chain fixed hard. Fasten the ends of the handspike to the topmast and wedge all tight.

9. Suppose the lower or the top-mast trestle-trees are weak, what would you do?

Place an iron bar through the sheave hole at the heel of the mast; make fast the end of a chain at one end of the bar, pass it over the cap and under the other end of the bar, haul well tight, and pass over the cap again and under the end at the other side. Do this two or three times, and frap the parts tight between the doublings of the mast.

HEAVY WEIGHTS.

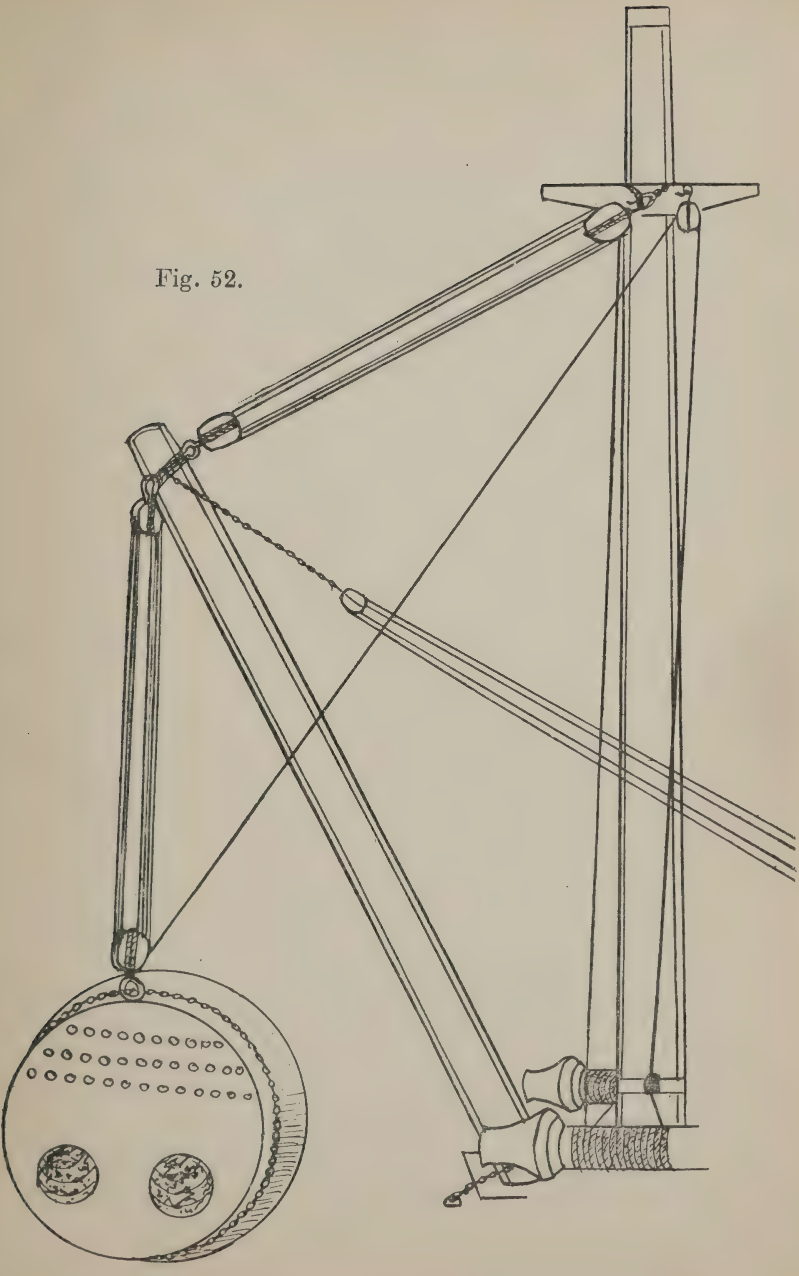
1. How would take out a heavy weight?

Rig a pair of sheers over the hatchway in such a manner that one leg is at the port forward corner, and the other leg at the starboard after corner. Guy these sheers to the hawse pipe forward and the quarter pipe aft. Untruss the main yard and lash it to the mast, having mats to prevent chafe. In the gangway have another pair of sheers for the main yard to lie in, lay it in and lash all together. With the sheers over the hatch lift the weight till it is high enough to clear the rail. then put on the yard-arm tackle, ease out; and when clear of the rail, lower away,

2. If you found the sheer leg giving, what would you do?

Bring the strain on the yard-arm tackle.

Fig. 52.



3. If the sheer legs are all right, but the yard-arm seems to be giving?

Haul on the sheer tackle, and get preventer lifts up to the yard-arm.

Note.—Instead of using sheers in the gangway, many use the main yard shored with a derrick, resting on a hard wood shoe, over a beam and lashed to a stanchion.

4. How would you take out a heavy weight in a steamer?

Rig a large spar with its heel resting on a wooden shoe, the shoe being a little at one side of the mast above the beam which is shored up from beneath the deck; rig a good span, a good purchase, good guys, and have preventer stays on the mast.

The majority of modern steamships are fitted with shoes or cups on the deck.

Flexible steel wire is now being used in lieu of chain or Manilla for both heaving purchase and spar.

MANAGEMENT OF A STEAMER AT SEA, &c.

GETTING UNDER WEIGH.

With regard to getting steamships under weigh from an open anchorage little can be said. The duty of the Officer in charge of the deck is to see that all the water in the deck steam pipes leading to the winches and windlass is blown out, and that the winches are well lubricated before starting; seeing that the wheel chains are in perfect order by putting the helm hard over to port and starboard. The steam steering gear should also be well looked to before starting, with the assistance of the engineers, also the officer should go aft and see that no boats are near the propeller.

In getting under weigh from a quay or wharf where moorings are used, special care must be taken in keeping warps and chains clear of the propeller, and an officer aft at the time is indispensable, as more mishaps occur to steamers through fouling the propeller with ropes and chains than from any other cause. Time should always be given, if possible, to allow of the stern ropes being hove in before the engines are moved. If circumstances will admit of it, a steamer's engines should be turned over the centres both ways, ahead and astern, before casting off, to admit of the condensed water in the engines being discharged, thereby ensuring their efficacy in starting quickly.

STEAM SHIPS UNDER CANVAS.

The following remarks will hardly apply to the modern steamship.

As to the management of steamers under canvas, no fixed rules can be laid down, owing to their masts being so differently placed. Most steamers, when under canvas with the wind on either side, carry a great amount of weather helm. This can only be regulated by reducing the amount of the after canvas.

If the vessel is to be some time under canvas, disconnect the engines and let the propeller revolve; if it is only for a temporary breakdown, then place the propeller (if a four-bladed one, and these are mostly now in vogue) with two blades up and down; this is the best position you can place it in; but as a rule all steamers steer very indifferently when dragging their propeller, and many are quite unmanageable under canvas with the propeller connected.

If on a lee-shore your engines become disabled, try every means to cast her on the best tack with her canvas, sometimes they will not pay off on either tack; if you are in soundings, then only one course is left, viz., to let go an anchor, and watch when she comes head to wind; then try and cast her with the head sheets, and slip the anchors; of course this is a last resource, but better do this than go ashore.

HOW TO MANAGE A STEAMER IN STORMY WEATHER.

When blowing hard with a very heavy sea and you wish to lay her to, double-reef the main-sail, set it taut-out and haul the boom flat amidships, ease the engines down to slow, or just to give her enough way to make her steer, then keep the sea about two or three points on the bow just so that the main-sail will keep full; this gives the sea a chance to run under her fore shoulder and to keep her bow up; whereas by keeping her dead head to wind she loses all her way, her canvas will not stand, she falls off into the trough of the sea, and becomes in a dangerous position; if she lies too badly on one tack bring the sea on the other bow and try that; if you find she falls off too much into the trough of the sea try to increase the amount of after canvas on the ship, and turn the engines a little faster; if this fails and you are in such a position that you cannot run her before the wind, then recourse must be had to a drog sail or sea anchor.

A SEA ANCHOR OR SEA DROG SAIL

TO LESSEN A STEAMER'S DRIFT, AND KEEP HER OUT OF THE TROUGH OF THE SEA.

This sea anchor should be carried by all steamers, and be ready at a moment's warning. Have two spars cut in lengths about half the beam of your vessel, say she is thirty-six feet beam, the length of the spars should be eighteen feet, and about nine to ten inches diameter; a strong iron bolt should be driven through the middle of these spars and secured by a nut and washer, making them like a pair of scissors, so that they can be shut up when not in use and stowed snugly away. When wanted, open them out till they form a cross; take a runner of $\frac{3}{8}$ths chain and swifter them in that position by hitching the chain round each leg of the cross (see diagram 53); make a double chain bridle fast to where the four dots are placed (this must be good chain), and you then have the skeleton of a kite. On these spars lash a double canvas sail to the chain by eyelet holes worked on the edge of the double sail to the chain you passed from leg to leg of the spars (see diagram 54); you then have what is termed a sea kite or drog sail. Pass a hawser through the double bridle and hitch it the same way as you would make a kite string fast. Take a small kedge anchor with about five fathoms of rope and make it fast to one of the spar ends, and

Fig. 53.

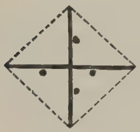
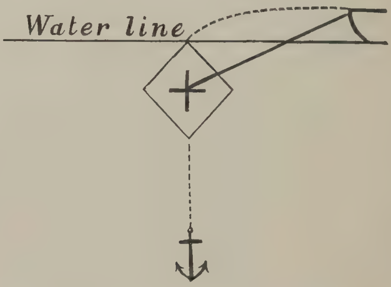


Fig. 54.



call this, for the purpose of explanation, the bottom of the kite; then to the other end of the same spar make fast a long line, which is to trip the kite to get it alongside easily. Having all things now in readiness, drop overboard the kite and kedge anchor before named; the kite will then assume a vertical position; pay away the hawser and keep the line attached to the upper end of the kite well slack; veer out the hawser to about sixty fathoms; and when this becomes taut it will set the kite to the sea the same as a common kite sets to the wind by its string, the vessel will ride easily by it, and it will stop her drift considerably, as she has a surface of one hundred and sixty-one square feet to drag through the sea, because the kedge keeps it well immersed.

When you are done with it, take the small line you made fast to the top of the kite to the winch and haul in, when the kite will immediately capsize to a horizontal position in the water, and can easily be brought alongside; hook a tackle on the sea anchor and heave it on board.

ANOTHER SEA ANCHOR.

Get a large sail, hitch the end of two warps along the sail in opposite directions, drop the sail overboard and pay out the warps to their full length, one warp leading out of the warping chock forward, and the other leading through the shoulder pipe.

HOW TO TAKE A CAST OF THE LEAD IN HEAVY WEATHER.

Presuming you want a cast of the lead in deep water, say from 90 to 100 fathoms, and it is blowing hard with a heavy sea running, it is a difficulty sometimes not easily got over, especially with a steamer in ballast. Thus, say the lead line is passed well forward, the lead primed, and everything ready for a cast; you ease the engines and stop her way through the water, the lead is then hove, down it goes, but you find before 100 fathoms of line is all run out your vessel's bow has blown off the wind, and the lead line trends broad out to windward, consequently no true cast can be got; the best way to get an approximation of the water is by passing the line from right aft of the taffrail to about midships, then heave the lead overboard amidships just before she has lost the last of her way; her bow may blow off then, but her stern remains as it were on a pivot, consequently the line does not trend out to windward, but care must be taken that the line does not foul the propeller. All seamen, however, know that to get a true deep water cast of the lead, with a ship in ballast or high out of water, is one of the most difficult things that can be accomplished with certainty on a dirty night.

With a deep loaded vessel it is a very different affair, and comparatively an easy matter; pass the line forward to about the fore rigging, ease the engines to dead slow, and when she loses her way stop her propeller and heave the lead, and in nine cases out of ten a true cast is thus obtainable.

It must be borne in mind in all cases that to get a true cast of the lead, a steamer must be brought head to wind and sea; in stormy weather it is also an important matter that the lead should be primed (even supposing that the nature of the bottom is not required) for by examining the lead when it is brought on board you can at once see if it has touched the bottom, supposing there is a doubt on the matter.

Also let the seaman remember that *one cast of the lead* may mislead, by its falling at times into fissures at the bottom, so that at least two casts are always indispensable, and a course should never be altered for a single cast, till verified by a second.

With a patent lead in shallow water, the ship need not be stopped. (See page 27.)

RESCUING THE CREW OF A DISABLED SHIP.

The best position to place a steamer near a disabled ship is to windward of her, for two reasons, viz., communication is more easily effected, and secondly her wreckage is generally floating away from her and might foul your propeller if you were to leeward of her. Steam your vessel into a position about half a mile dead to windward of the wreck, then put her head to wind, and let her drive down towards the wreck, tending her with the engines to keep her head to wind; when in a good safe berth off her, keep your ship in that position with the engines. Now we will presume that the sea is too heavy to launch a boat, there still remain two ways of a communication; first pay a line with a life buoy attached over the stern, which will drive down to the wreck; the disabled ship's crew should make another line fast to the buoy and the crew can be pulled on board in the life buoy one at a time, care being taken that each man is lashed in the buoy. Another plan for getting communication between two ships, in heavy weather, is to take one of the ship's rockets, and make fast to its stick the end of a ball of marline; then flake the marline loose on the deck, and point and fire the rocket, which if it is a good ship's rocket, will carry ordinary marline 230 feet, with a moderate gale, fired before the wind; but if you have a small fishing line it will carry it 300 feet. This has been tried by experiments on shore, and is of great utility.

If you can with safety put out a boat, give your steamer a broad sheer, drop your boat to leeward, and slack her down with a line to the wreck; if this precaution be used two men in the boat is plenty to man her, and these two men should have cork life belts on; one man should tend the line in the boat's bow, and the other tend her with a long steering oar over her stern; and allow no luggage to be placed in the boat till all the lives are saved. Great care is necessary in veering away this boat line; watch the sea well and veer away as circumstances will permit; for if the line is veered away too fast. the boat may turn athwart the sea and capsize; and if such an accident occurs at that time men are apt to loose heart, and the crew of the disabled ship are left to their fate.

It must be borne in mind that if the sea is very heavy a large canvas bag full of small holes and filled with oil put over your vessel's stern during these operations, will greatly smooth the broken sea on the weather side of the wreck.

ANOTHER METHOD.

If the sea is not too rough, steam to windward of the disabled ship, and launch the boat, taking care that all the necessary gear is in the boat, including blue lights if towards night time; the boat will have a fair wind towards the ship, and if likely to broach to, put the drogue out aft. The time the crew are being taken off the disabled ship, steam down to leeward and wait of the boat coming back.

TOWING VESSELS.

There are various ways:—

(*a.*) If you have a heavy tow, with a strong sea running, take the cable chain of your tow out of one hawse pipe and

Fig. 55.

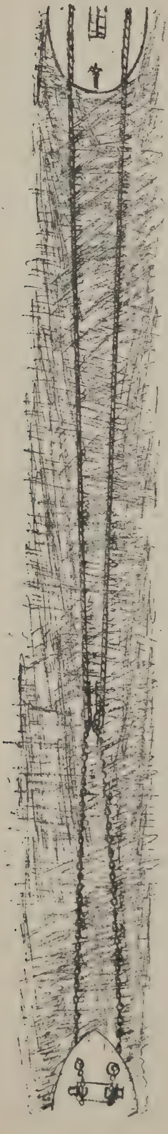


Fig. 56.

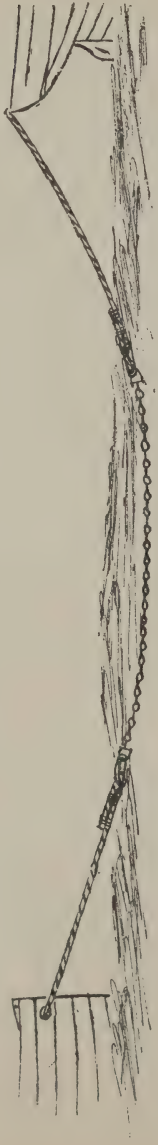
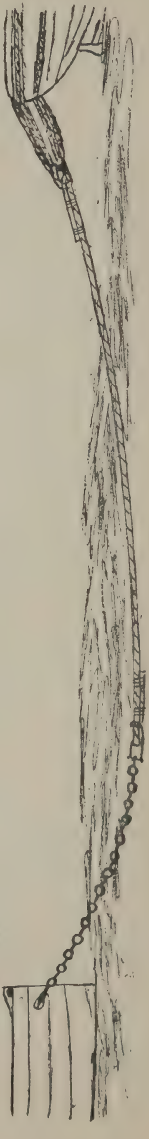


Fig. 57.



put it into the other, leaving a bight of about twenty fathoms. In the middle of this bight after it is well parcelled, make fast your towing hawsers, and veer them out to the bare end (fig. 55); try to keep your vessel with as little way as possible if blowing hard and a strong sea against you, bearing in mind that you had better tow a vessel to a port five hundred miles before the wind, than one hundred miles against the sea and wind, for in the latter case it is ten chances to one you will carry away all your hawsers and not succeed at last. Care must be taken in boarding a derelict ship, for just as you get on board she might be in the act of foundering.

(*b.*) Bend a good hawser to the cable of the ship being towed; some prefer two hawsers bent to the cable.

(*c.*) Hawser from each ship with cable in the middle (fig. 56).

(*d.*) Bridle of several parts of manilla or coir, good hawser and cable (fig. 57).

In all methods of towing particular attention must be given to the parcelling, and wherever there is any chafing, the parcelling will in all likelihood have to be repaired every day.

HOW TO USE STEAM APPLIANCES IN CASE OF FIRE.

If at sea and the ship takes fire, immediately stop her; if the fire is aft try and keep head to wind, but do not give her any more way than you can help, as it increases the draft; if the fire is forward, keep her right before the wind and stop the engines; if any of the hatches are off, batten them down immediately, and block up the mouths of the ventilators. While this is being done, if the seat of the fire cannot be reached, screw on the deck hose, cut a small hole in either the deck or in the hatchway large enough to admit the nozzle of the hose, and keep playing upon the place where you surmise the fire is situated; open the sluices so that the water will find its way into the engine room and be discharged overboard.

If the fire decreases, be very careful in taking the hatches off, as the least air might fan a smouldering fire into a blaze, try to find where the fire originated, and throw any smouldering cargo overboard, if it can be got at.

If the hose is insufficient, connect the steam pipe with the hold under a good pressure of steam, the same time as the hose is playing upon the fire.

If the fire still gains when all the deck hoses and steam pipes are on, get the boats provisioned, and see all clear for saving life. If the vessel is in a position to be run on shore, and the fire is gaining rapidly, then run her on shore. Open all sluices and sea cocks to scuttle her, which perhaps will save the ship; this of course is a last resource.

Some of the latest steamships have their holds fitted throughout with steam injectors.

THE EFFECTS PRODUCED BY GOING ASTERN AND TURNING SHORT ROUND.

Right-handed propellers (and this means those which turn the same way as the hands of a clock, the observer being placed abaft of a clock with its face turned aft), always turn the ship's head to starboard when going astern, and the opposite with left-handed propellers, which turn her head to port. Great care should be taken in narrow waters in not giving a ship with a right-handed propeller too much *port* helm, because if she will not clear the object by going ahead, full speed astern will cause her to fly to starboard and make worse of it; so a ship with a left-handed propeller should be very carefully watched in giving her *starboard* helm, for if she will not clear by going ahead, full speed astern makes the matter worse. These remarks apply when a vessel has more way on her than will pass the object, and too much to stop her before reaching it.

No steamer can be steered to go straight astern, no matter what precautions are taken, as her propeller, in the end, if unaffected by tide or current, will eventually put her athwart, and if at sea turn her completely round, bearing in mind that with the right-handed propeller she will come round to starboard all the time, and the reverse with the left-handed propeller; she will, if unaffected by the tide, pay little attention to the rudder at first, but of course use the rudder to help her round directly she begins to get stern-way, or rather the rudder is of no use to the ship till she gets stern-way upon her, for she will begin to cant long before the rudder becomes useful.

In coming astern and you want a steamer to come to starboard with her bow, put the rudder hard to starboard, and *vice versô* with a left-handed propeller. If you wish her to cant to port with a right-handed propeller, you cannot do so by going astern, as no matter which way you put the helm, if she have little way on her she will go to starboard, and the same thing reversed will occur with a left-handed propeller.

In turning short round at sea a steamer with a right-handed propeller turns quickest with her port helm, thus—Say you are going full speed ahead, put the helm hard-a-port, and when she is on a full swing of port helm, stop the engines, and when she loses way bring the engines full speed astern and reverse the helm, viz., put it hard-a-starboard, and she will come shorter and quicker round in this way than she will by going ahead at full speed with either helm.

Of course these observations mean if the ship is uninfluenced by tide, wind or current, as either of these may cause a contrary effect to take place, therefore all circumstances must be taken into consideration. Wind or tide will cant steamers, especially light ships, against their propellers, and it must be observed that whichever way they first begin to cant, they will continue to do so to the end; that is, when going astern.

BALLAST TANKS.

In the latest construction of ballast tanks there is only one inlet for water, and this inlet is through a valve box placed in the engine room, which is under the control of the engineer, and all the ballast tank valves lead into this box, which is well marked, viz.—fore hold, main hold, after hold, consequently no water can pass into the tanks unless it comes through the valve-box in the engine room, each tank having a separate pipe leading from it to the valve-box. These pipes are all connected by valves leading to the donkey engine, and are used to pump the water out of the tank.

There are also sounding pipes fitted to the tanks, which ought to be frequently used when the ship is full of cargo.

When filling the tanks great care should be taken that they are quite full, for if they are not completely filled up, it causes the ship to roll heavily, and puts great strain upon the tank top. This is easily known by keeping the sounding pipe cover off, for when the tank is nearly full the water will commence to fly several feet above the deck, but will gradually subside till the water in the sounding pipe is up to the level of the deck, when the tank will be quite full.

SLUICES.

The water-ballast tanks of steamers are seldom carried into the sides of the vessel, consequently between the outside of the tanks and the side of the vessel there remains a space of about eighteen inches in width fore and aft of the tanks; this space is constructed as a water-way, and in which are the sluices. This arrangement is to afford means of getting the water to the engine room in case the ship is damaged or holed above the tank tops.

The sluices are placed at the after end of tank sides in the fore holds, and at the fore part in the after holds, and are situate at every water-tight bulk-head fore and aft on both sides of the vessel. The valves of these sluices are connected to a vertical rod that leads to the upper deck immediately above the sluice, and are covered by brass water-tight caps on the upper deck, which are marked so that you can see when they are open or shut, and that duty devolves upon the carpenter of the vessel. There ought to be a sounding pipe at every sluice, so that the holds can be sounded every four hours. The waterways to the sluices should be frequently cleaned out, as they are the only means (excepting the hand pumps) of getting clear of any water in the holds, when the ship is full of cargo.

The sluices being worked by a key, care should always be taken that the brass cap on the upper deck is securely screwed on after altering them, as many cargoes have been damaged through inattention to this important point. In modern ships there are pipes with strum boxes on the ends leading from each hold direct to the engine room (page 108).

RIGGING PURCHASES FOR LIFTING HEAVY WEIGHTS.

Heavy articles in steamers must first be lifted from the hold by a pair of sheers on to the upper deck, these sheers should stand athwart-ships; then to get them over the side another pair of sheers is necessary, which should stand fore and aft;

also two large spars are necessary, rigged out through the ports, securely lashed, and projecting about twenty feet outside her broadside. These spars should be fitted with heavy purchase blocks at their extreme ends, and are used to bouse whatever you are discharging out of the vessel clear of the side. After heaving up the weight, whatever it is, by the athwart-ship sheers, when it is level with the upper deck lash on the lower purchase block of the fore and aft sheers, and secure to this lashing the tackles connected with the bowsing-out spars before named; heave away upon the athwart-ship sheer purchase till it is some few feet above the rail, then hang that purchase off and belay it; take the fore-and-aft sheer purchase to the winch, and haul away upon the tackles fast to the bowsing-out spars; this will take the article clear to the side; at the same time keep slackening away upon the athwart ship sheer purchase till the fore-and-aft sheers have all the weight, then lower away at pleasure.

Use great care in securing the heels of the fore-and-aft sheers; have them well cleated and secured with chains, so that they cannot lift upwards; many accidents occur with heavy weights by the fore and aft sheer legs lifting, for if they lift an accident is inevitable. Locomotives have been discharged in this manner weighing nearly thirty tons each. The topping lift for the fore-and-aft sheers should be taken —one aft to the mainmast, the other to the foremast, and slackened away till the sheer head plumbs the rail; too much care cannot be used in rigging these sheers, as they are a great source of anxiety.

These remarks are mostly intended for long steamers whose masts are far apart, consequently none of their yards are of any use for discharging heavy weights; also, it is presumed that she is in an open roadstead, or in some position where no shore appliances can be brought to bear on her, and the seaman is left to his own resources.

If the seaman is afraid that the topping lifts of the fore and aft sheers have too much drift, it will be advisable that two heavy preventive topping lifts be taken from the sheer heads underneath her bottom and securely fastened on the upper deck on the other side; this will seldom be necessary, but remember the sailor's old proverb—"better be sure than sorry."

It may also be observed that the fore and aft sheer legs should be placed on the opposite side of the deck to that on which you are going to discharge the cargo, and the athwartship sheer legs placed at the after part of the hatch, one on each side of the deck; they should all be placed upon deck beams, which should be securely shored down below the upper deck; and good cleats should be put on the sheer lashings at the sheer heads to prevent slipping.

ANOTHER METHOD.

Most steamers now carry a large spar for heavy weights, the spar is placed with its heel resting on a wooden shoe, the shoe being a little at one side of the mast above a beam which is shored up from beneath the deck. Rig a good spar, a good purchase, good guys, and preventer stays on the mast (see Fig. 52).

HOW TO CALCULATE THE CAPACITY OF A BUNKER OR HOLD.

Multiply the length by the breadth and by the depth, will give the cubic capacity of the bunker or hold, providing the bunker or hold is a square or oblong.

Note.—Should the bunker or hold be neither square nor oblong, the mean breadth, mean depth, and mean length will have to be taken.

A ton of Welsh coal = 40 cubic feet, Newcastle coal = 43 cubic feet, and bunker space allowing for bad trimming = 48 cubic feet.

In finding the amount of coal a bunker will hold, divide the cubic capacity by 48.

Example. A bunker is 12 feet long, 40 feet broad, and 18 feet in depth; find the amount of coal the bunker will hold.

Length 12
Breadth 40
480
Depth 18
3840
480
48)8640(180 tons
48
384
384
0

HOW TO CALCULATE A FREIGHT.

Multiply the quantity of cargo in the ship by the rate of freight, will give the total freight a ship would earn.

Example.—What freight would a ship earn carrying 2,600 tons at the rate of 6s. 3d. per ton?

2,600 tons × 6s. 3d. = 16,250s. = £812 10s. freight.

HOW TO CALCULATE COMMISSION.

Multiply the total freight by the rate of commission and divide by 100.

Example.—What would be the commission at $2\frac{1}{2}$ per cent. on £1,800 freight?

As £100 : £1,800 : : £$2\frac{1}{2}$: x

$$\begin{array}{r} 2\frac{1}{2} \\ \hline 3,600 \\ 900 \\ \hline 100)4,500(\text{£}45 \text{ commission.} \\ 4,500 \\ \hline \end{array}$$

A CUBIC FOOT OF

Fresh water weighs - - - $62\frac{1}{2}$ lbs.
Sea ,, ,, - - - 64 ,,
Oil ,, - - - 57 ,,
Any liquid = $6\frac{1}{2}$ gallons.

A GALLON OF

Fresh water = 10 lbs.
Sea ,, = $10\frac{1}{4}$,,
Oil = 9·3 ,,

IN DRY DOCK.

When about to dock be careful that she is on an even keel and has no list either way, for if this is attended to she will take on the chocks very readily and easily; be sure the holds are dry and no water in the engine-room bilges. It is generally the custom to knock a rivet out in each water-tight compartment near the keel, so that the tanks may run dry, and can be washed out with fresh water before painting ; examine the fore and aft peaks well, as rust and dirt are mostly found collected in these places ; examine well the lower rudder gudgeons, and the boss and keys of the propeller, also all the sea cocks and valves that are under water when afloat.

SHIFTING FUNNEL FROM ONE SHIP TO ANOTHER.

Rig sheers at the fore side of the funnel, lash the purchase to the funnel and heave it clear of the deck, then lash the other ship's purchase on and slack away, the other ship will take it from you.

SHIFTING PROPELLER FROM ONE SHIP TO ANOTHER.

Hang the propeller with quarter tackles hooked to the shackles under the counter or to chains over the quarters, haul in the tail end shaft, lash the other ship's purchase to the propeller, slack away on the outer tackle and heave on the inner, the other ship will take it from you.

If the propeller has to go into a lighter, slack away on the outer tackle, and heave on the inner until the inner tackle has the whole weight of the propeller, then lower away into the lighter.

SYSTEM OF BUOYAGE.

Starboard hand buoys are conical, and painted one colour.

Port hand buoys are can, and painted two colours, or a different colour to the starboard hand buoys.

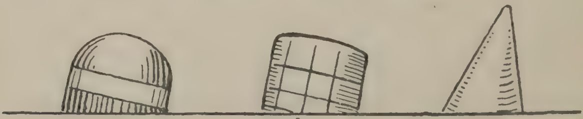
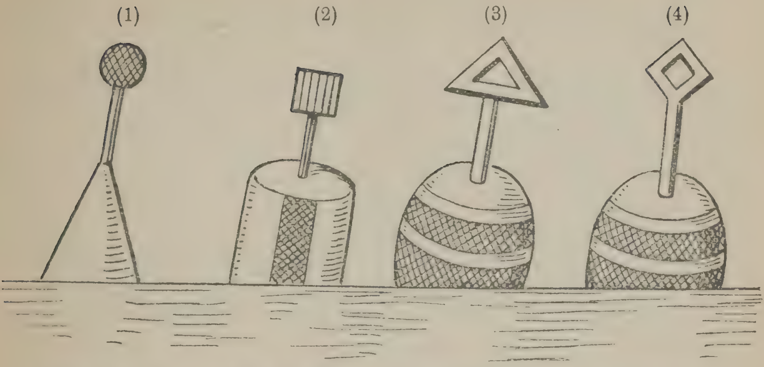

Middle Ground.
Port Hand
Starboard Hand.

Fig. 58.

Middle ground buoys are spherical, and have horizontal white rings painted round them.



Staff & Globe. Staff & Cage. Triangle. Diamond.

Fig. 59.

UNIFORM SYSTEM OF BUOYAGE.

The mariner when approaching the coast must determine his position on the chart, and must note the direction of the main stream of flood tide.

The term Starboard hand shall denote that side which would be on the right hand of the mariner either going with the main stream of flood or entering a harbour, river or estuary from seaward; the term Port hand shall denote the left hand of the mariner under the same circumstances.

Buoys showing the pointed top of a cone above water shall be called Conical, and shall always be Starboard hand buoys as above defined.

Buoys showing a flat top above water shall be called Can, and shall always be Port hand buoys as above defined.

Buoys showing a domed top above water shall be called Spherical, and shall mark the ends of middle grounds.

Buoys having a tall central structure on a broad base shall be called Pillar Buoys, and like other spherical buoys, such as Bell buoys, Gas buoys, Automatic sounding buoys, &c., &c., shall be placed to mark special positions either on the coast or in the approaches to harbours, &c.

Buoys showing only a mast above water shall be called Spar buoys.

Starboard hand buoys shall always be painted in one colour only.

Port hand buoys shall be painted of another characteristic colour, either single or parti-colour.

Spherical buoys at the ends of middle grounds shall always be distinguished by horizontal stripes of white colour.

Surmounting beacons such as staff and globe, &c., shall always be painted of one dark colour.

Staff and globe shall only be used on Starboard hand buoys (1, Fig. 59); Staff and Cage on Port hand (2); Diamonds at the outer ends of middle grounds (4), and Triangles at the inner ends (3).

System of Buoyage in use by the NORTHERN LIGHTHOUSE COMMISSIONERS.

Entering port, &c., from seaward—*Red* buoys must be left on the starboard, and black buoys on the port side, passing in.

Buoys coloured *red* and black are placed on detached dangers, and may be passed on either side.

General.

All buoys have their names painted on them.

Fairway Buoys are plainly marked.

The figures following the colour of the buoys indicate the depth of water in feet in which they lie at low water spring tides. Where it has been necessary for space, abbreviations as to buoys are as follows:—

Colour—Wh.—White. Blk.—Black.
,, Cheq.—Chequered.
,, Rings, Belts, Bands—Striped horizontally.
,, Strip.—Striped vertically.
Shape—Can re., or C. R.—Can reversed.
,, Con.—Conical. Cyl.—Cylinder.
,, Sph.—Spherical.

Extra Distinctions.
S. and C., or S.C.—Staff and Cage.
S. and X—Staff and Cross.
S. and Diam., or S.D.—Staff and Diamond.
S. and Globe, or S.G.—Staff and Globe.
S. and Tri., or S.T.—Staff and Triangle.

CARGO OF GAS COAL.

Keep the ventilators well trimmed, take a few hatches off during the day in fine weather, and test the temperature daily with a thermometer lowered down a tube, that leads to the bottom of the ship through the cargo.

OIL TANKS.

Be sure and take no naked lights into the tanks, use electric or safety lamps. When cleaning the tanks fill them with steam, then wipe them down with wads. When filling the tanks with oil run them up no higher than the expansion tank so as to allow the oil to expand.

COLLISIONS.

Ascertain the other ship's name and port of registry, render all the assistance you possibly can, he must do the same to you, if required. A ship wilfully leaving another in distress after collision will be held in default.

LYING WITH BOTH ANCHORS OUT IN A TIDE WAY.

Leave orders before going below to be called about an hour before slack water. Suppose you were lying at slack water with a turn in the cables, no wind, no steam; you want to make sure of the ship taking the turn out when she turns round. Run a small kedge away from the opposite quarter you want the tide to catch her under, heave on the kedge rope and place the ship in position, the tide will do the rest.

TAKING A STEAMSHIP FROM ALONGSIDE A QUAY.

Suppose the wind and tide to be ahead. Get a spring from the inside quarter, give her a few turns ahead and take in the slack of the spring; hard over the helm, slack off the head ropes and go off head first, holding on to the spring until far enough off.

Suppose the wind and tide to be aft. Get a spring from the inside bow, and go off stern first.

LOADING A SHIP IN SHALLOW WATER.

Be careful not to get too much cargo in either end, keep the ship upright, and sound round the ship to ascertain if on the ground.

GRAIN CARGOES.

A ship carrying grain in bulk will have to be divided into compartments by means of fore and aft shifting boards, and athwartship bulkheads securely shored from the side of the ship, and grain-tight from bottom of hold to deck; the 'tween decks will have properly constructed feeders to feed the lower hold.

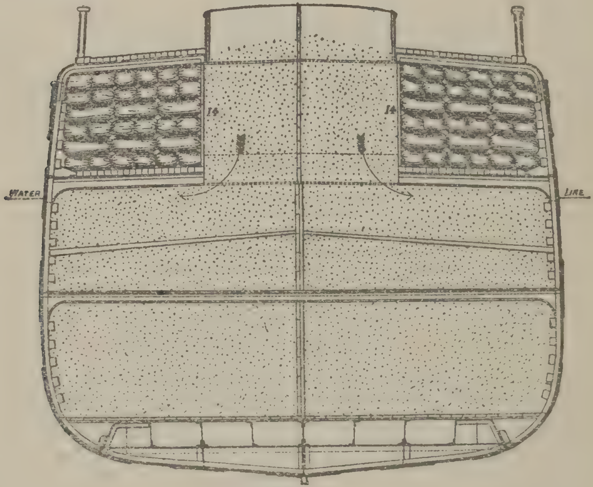


Fig. 60.

THE LAW ON "CARRIAGE OF GRAIN," 1880.

1. When will this law apply to your ship?

When she loads with grain in the Black Sea or the Mediterranean, and is bound outside the Straits of Gibraltar; or if she loads grain on the Coast of North America.

2. What grain may be carried between the decks?

Between the decks, or if the ship has more than two decks, between the main and upper decks, only such grain in bulk as may be necessary for feeding the cargo in the hold, and this grain must be carried in properly constructed feeders.

3. What rule is laid down for ships that have not properly constructed feeders?

That *not less* than one fourth of the grain carried in the hold or compartment (as the case may be) *shall be in bags*, supported on suitable platforms laid upon the grain in bulk.

4. There are certain exceptions to this. State them.

1. To oats or cotton seed.
2. To sailing ships of less than 400 tons registered tonnage, if not engaged in the Atlantic trade.
3. To a ship in the Mediterranean or Black Sea, if the ship is divided into compartments by substantial transverse partitions, and is fitted with longitudinal bulkheads or proper shifting boards, and if she does not carry more than 1,500 quarters in any one compartment or division; and that each division of the lower hold is fitted with properly constructed feeders from the between decks.
4. If the grain is only one-half of the whole cargo, the rest being cotton, wool, &c., or other suitable cargo, so stowed as to prevent the grain shifting.

5. Must shifting boards be used?

Yes, whether the grain is in bulk or in bags, unless you have a properly constructed longitudinal bulkhead.

6. Where are these shifting boards to be placed?

From deck to deck, or from deck to keelson, fore and aft, and must be properly secured; and if the grain is in bulk, must be fitted grain-tight with proper fittings between the beams.

7. What kind of boards should they be?

3-inch deals.

8. How are these shifting boards secured?

Some ships have single stanchions, with a hook for the boards to fit into; but in most cases the stanchions are double, and the boards between them.

9. What are the three things to be seen to in loading grain?

That it is properly stowed, trimmed, and secured.

MISCELLANEOUS QUESTIONS.

1. Riding in a gale, ship straining at cables, what would you do to ease the windlass?

Get a spring on to both cables, made fast at the fore side at windlass, and lead them well aft, having an equal strain on windlass and bitts or wherever the springs are fast to.

2. Steaming head to wind and sea, fore hatch stove in, what would you do?

Ease the ship down or put her before the wind, then get the hatch secured.

3. What would you do if the forecastle was on fire?

Get the ship before the wind, then the wind will stop the fire from spreading aft, if got at in time.

4. How would you stow a full cargo of 5000 tons in casks, no 'tween decks?

A platform or temporary 'tween decks will have to be built, as the lower tier would never bear the weight of the upper tiers.

5. You part your cable, how would you sweep for your anchor?

Get two boats, and drag a lead line (weighted in the middle) over the ground; the line will catch the fluke of the anchor, then slide a running bowline down the two parts, after they are brought together.

6. What would you do going alongside a quay with a strong wind blowing right on?

Drop the anchor on the bottom, and dredge her alongside.

7. You are holed just below the water in harbour, what would you do?

Give the ship a list, by shifting cargo, filling boats with water, running a trimming tank up, or filling one boiler whilst emptying another.

8. How would you heave your anchor up, with a messenger windlass, No. 1 winch broke down?

Lengthen the messenger, and connect it with No. 2 winch.

9. Ship ashore with decks listed towards the sea, what would you do?

Try and get her listed with her decks towards the shore.

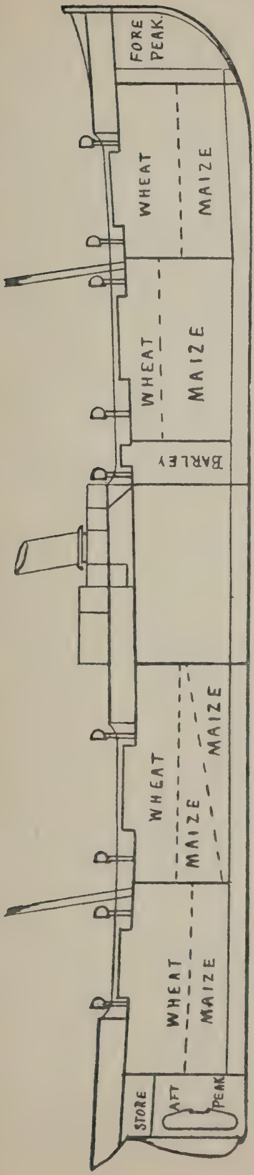


Fig. 61.

10. Lying in roadstead, captain on shore, coming on to blow, what would you do in a steamship?

Order steam, pay out more chain and let go the second anchor; if it is necessary to slip, buoy the cables and steam to sea.

11. Getting underway in a steamship, you are afraid of the anchor going through the bow, on account of the heavy swell; what would you do?

Leave the anchor hanging under the forefoot, and steam to sea; when far enough out, put the ship stern on to the sea, and take the anchor on board.

12. What signals do you show when loading gunpowder?

Red flag by day, red light at night.

13. Where would you stow gunpowder?

In a properly constructed magazine, near or in the hatchway.

14. What would you do after cleaning limbers?

Disinfect them with lime.

15. You are steaming up or down a river, with a six knot tide behind you; how would you bring the ship to?

Drop the anchor on the bottom and come astern; when head to tide, slack away the cable.

16. You are loading general cargo; how would you tell where the different kinds of goods were stowed?

By stating them on a plan of the hold, (Fig. 61.)

17. You have lost your propeller (light ship), how would you ship the spare one in an open roadstead or at sea?

Heave the propeller out of the hold and swing it over the rail on to the side of the ship; overhaul a good purchase from aft along the ship's side and bend on to the propeller; make fast another purchase from forward; heave on the after purchase and slack away on the forward one until the propeller is far enough aft to be slung with the quarter tackles. Pump out the after ballast tanks, keep the fore ones full, and run sufficient water into the fore hold to raise the after end with the stern tube clear of the sea. Place the propeller into position with the quarter tackles, having the boss fair over the stern tube; slide out the tail end shaft, key it and screw up.

18. How would you get a heavy weight from under the hatch to the bulkhead?

Place it on skids, rollers, or stokehold plates; heave on a good purchase and assist the purchase with screw-jacks and crowbars.

19. How would you moor a ship between two buoys, wind and tide ahead?

Keep the ship head on to tide with just sufficient way on her to stem the tide; get close to the weather buoy and make fast a bow rope, heave taut and reeve a ring rope from the ship through the ring of the buoy and bend on the cable; heave out the cable to the buoy, and shackle to the ring; heave the cable tight with the windlass, then get out the after moorings.

20. You are lying three miles off shore, a workman is severely injured, what would you do?

Lose no time in getting him on shore; if he cannot be moved, get a doctor off as quick as possible, and in the meantime, place him in the most comfortable position and render whatever first aid is necessary.

21. What would you be particular about regarding ships' davits?

Have the boats frequently swung out to keep them in working order.

22. How would you get out a boat in a heavy sea?

Bend a good line to the bow of the boat, lead it well forward, outside everything on the side of the ship and make fast; haul tight both tackle falls, swing out the forward davit, then the after; place two hands in the boat and lower away; unhook both tackles immediately the boat takes the water.

23. Prepare steamer for light passage?

Have everything securely lashed, after peak tank and all other tanks full.

Some ships on a light passage plug the scuppers and flood the after deck; others flood the after hold up to the tunnel top, shoring down the ceiling or taking it entirely up.

24. Strong tide, get a steamer into dry dock?

Get the ship stern on to tide, below the dock if it be flood tide, and above the dock if it be ebb. Heave on the bow rope and slack away on the after one, placing the ship heading into the dock; the stern rope will keep the ship in position as she is hove into the dock.

In large ships it is customary to have the assistance of one or two tugs, and to wait until slack water.

25. You are discharging with six or seven whips from the gaff; the gaff carries away, what will you do?

Rig a strong span from one mast to the other, and replace the whips from the span.

26. How often should you clean fresh water tanks?

If possible, every six months; they should always have a coating of cement wash or lime before filling up.

27. Prepare a hold for flour after discharging paraffin?

Steam the hold well, then dry inside with wads; rig wind-sails and trim ventilators.

A large number of the modern steamships are fitted throughout with steam injectors.

28. You are lying on a shore, the tide is rising and the ship will not float, she is stuck in the mud; what will you do?

Shake the ship as much as possible, by going ahead and astern with the engines, heaving on warps on each side; do everything possible to vibrate the ship.

If you are going alongside a quay where you expect your ship is likely to stick (some berths are noted for this), pass a couple of chains under the bottom of your vessel, and when the tide makes heave on these chains, which will break the mud and allow the water to flow under the ship.

STRENGTH OF ROPES.

Breaking Strain, &c.

(Hawser-laid.)

Square the circumference and divide by three for the breaking strain, in tons; by four for the proof strain; by six for the working strain.

Example:—

6 inches in circumference
6
—
3)36
—
12 Tons = Breaking strain
—

Weight a Rope will Lift when Rove as a Tackle.

Multiply the weight the rope is capable of suspending by the number of parts at the movable block, and subtract one-fourth of this for resistance.

Relative Strength of Chain and Rope.

Consider the proportional strength to be ten to one, using the diameter of the chain and the circumference of the rope. Half-inch chain will replace five inch rope.

To Calculate the Weight of Rope.

Three strand, hawser-laid, 25 thread yarn tarred. Multiply the square of the circumference by the length in fathoms, and divide by 4·24 for the weight in lbs.

The divisor for hempen cables is 4·79.

THE USE OF OIL FOR MODIFYING THE EFFECT OF BREAKING SEAS.

The Board of Trade calls the attention of Officers to the fact "that a very small quantity of oil, skilfully applied, may prevent much damage both to ships (especially the smaller classes) and to boats, by modifying the action of broken or troubled waters. The principal facts as to the use of oil are as follows:—

"1. On free waves, *i.e.*, waves in deep water, the effect is greatest.

"2. In a surf, or waves breaking on a bar, where a mass of liquid is in actual motion in shallow water, the effect of the oil is uncertain; as nothing can prevent the larger waves from breaking under such circumstances; but even here it is of some service.

"3. The heaviest and thickest oils are most effectual. Refined kerosene is of little use, crude petroleum is serviceable when nothing else is obtainable; but all animal and vegetable oils, such as waste oil from the engines, have great effect.

"4. A small quantity of oil suffices, if applied in such a manner as to spread to windward.

"5. It is useful in a ship or boat, both when running or lying to, or in wearing.

"6. No experiences are related of its use when hoisting a boat up in a sea-way at sea, but it is highly probable that much time and injury to the boat would be saved by its application on such occasions.

"7. In cold water, the oil, being thickened by the lower temperature, and not being able to spread freely, will have its effect much reduced. This will vary with the description of oil used.

A later method is to allow the leakage of oil through each of the forward closet pipes.

"8. The best method of application in a ship at sea appears to be; hanging over the side, in such a manner as to be in the water, small canvas bags, capable of holding from one to two gallons of oil, such bags being pricked with a sail needle to facilitate leakage of the oil.

"The position of these bags should vary with the circumstances. Running before the wind they should be hung on either bow—*e.g.*, from the cathead, and allowed to tow in the water.

"With the wind on the quarter the effect seems to be less than in any other position, as the oil goes astern while the waves come up on the quarter.

"Lying-to, the weather bow and another position farther aft seem the best places from which to hang the bags, with a sufficient length of line to permit them to draw to windward while the ship drifts.

"9. Crossing the bar with a flood tide, oil poured overboard and allowed to float in ahead of the boat, which would follow with a bag towing astern, would appear to be the best plan. As before remarked, under these circumstances, the effect cannot be so much trusted.

"On a bar with the ebb tide it would seem to be useless to try oil for the purpose of entering.

"10. For boarding a wreck, it is recommended to pour oil overboard to windward of her before going alongside. The effect in this case must greatly depend upon the set of the current, and the circumstances of the depth of water.

"11. For a boat riding in bad weather from a sea anchor, it is recommended to fasten the bag to an endless line rove through a block on the sea anchor, by which means the oil is diffused well ahead of the boat, and the bag can be readily hauled on board for refilling if necessary.

BRIEF RULES FOR THE USE OF OIL AT SEA..

From the U.S. Pilot Chart of the North Atlantic Ocean, March, 1889.

On account of the importance to navigators of a knowledge of the use of oil to prevent heavy seas from breaking on board, the Hamburg Nautical School offered a prize last year for the best essay on the subject. It is gratifying to this Office to know that one of its voluntary observers, Captain R. Karlowa, of the Hamburg-American Steamship Company, won the prize, and a brief synopsis is given herewith of the most important results of his studies and experience, based almost entirely, he says, upon the published records of this Office.

In the diagrams the arrows denote the direction of the wind and sea; the flowing lines indicate the spreading oil.

Scudding before a gale (Fig. 62), distribute oil from the bow by means of oil bags or through waste-pipes; it will thus spread aft and give protection both from quartering and following seas. If only distributed astern (Fig. 63), there will be no protection from the quartering sea.

Running before a gale, yawing badly and threatening to broach-to (Figs. 64 and 65), oil should be distributed from the

Fig. 62.

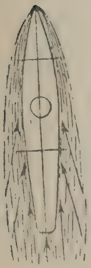


Fig. 63.

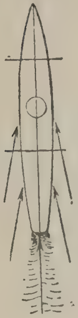


Fig. 64.

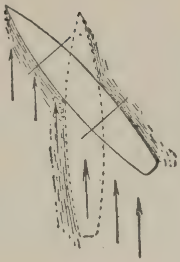
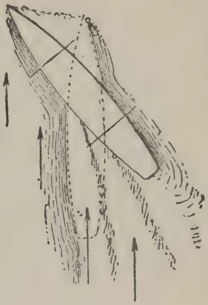


Fig. 65.



bow and from both sides, abaft the beam. In Fig. 64, for instance, where it is only distributed at the bow, the weather quarter is left unprotected when the ship yaws. In Fig. 65 however, with oil bags abaft the beam as well as forward, the quarter is protected.

Fig. 66.

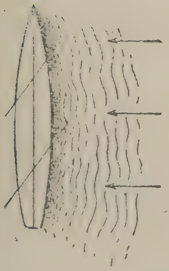


Fig 67.

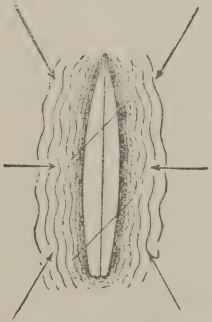
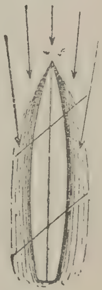


Fig. 68.



Lying-to (Fig. 66), a vessel can be brought closer to the wind by using one or two oil-bags forward, to windward. With a high beam sea, use oil-bags along the weather side at intervals of 40 to 50 feet.

In a heavy cross-sea (Fig. 67), as in the centre of a hurricane. or after the centre has passed, oil bags should be hung out at regular intervals along both sides.

Steaming into a heavy head-sea (Fig. 68), use oil through forward closet-pipes. Oil bags would be tossed back on deck.

Fig. 69.

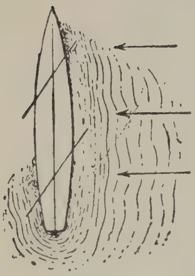


Fig. 70.

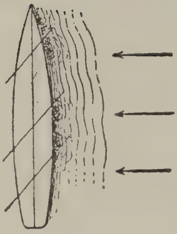


Fig. 71.

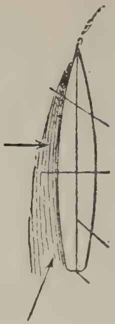
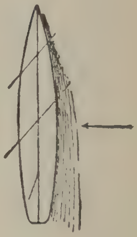


Fig. 72.

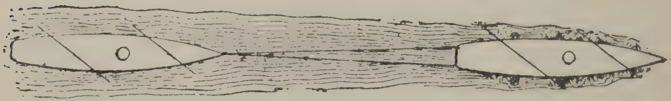


Drifting in the trough of a heavy sea (Figs. 69 and 70), use oil from waste pipes forward and bags on weather side, as in Fig. 70. These answer the purpose very much better than one bag at weather bow and one at lee quarter, although this has been tried with some success (Fig. 69).

Lying-to, to tack or wear (Fig. 71), use oil from weather bow.

Carrying on, with high wind abeam and heavy sea (Fig. 72), use oil from waste-pipes, weather bow.

Fig. 73.



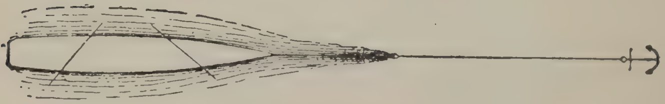


Fig. 74.

Towing another vessel in a heavy sea, oil is of the greatest service, and may prevent the hawser from breaking (Fig. 73). Distribute oil from the towing vessel, forward and on both sides. If only used aft, tow alone gets the benefit.

At anchor in an open roadstead use oil in bags from jib-boom, or haul them out ahead of the vessel by means of an endless rope rove through a tail-block secured to the anchor chain (Fig. 74.)

A vessel hove to for a pilot (Fig. 75), should distribute oil from the weather side and lee quarter. The pilot-boat runs up to windward and lowers a boat, which pulls down to leeward and round the vessel's stern. The pilot-boat runs down to leeward, gets out oil-bags to windward and on her lee quarter, and the boat pulls back around her stern, protected by the oil. The vessel drifts to leeward and leaves an oil-slick to windward, between the two.

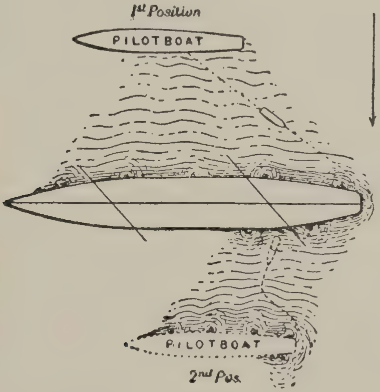


Fig. 75.

There are many other cases where oil may be used to advantage—such as lowering and hoisting boats, riding to a sea-anchor, crossing rollers or surf on a bar, and from life-boats and stranded vessels. Thick and heavy oils are the best. Mineral oils are not so effective as animal or vegetable oils. Raw petroleum has given favourable results, but not so good when it is refined. Certain oils, like cocoanut oil and some kinds of fish oil, congeal in cold weather, and are therefore useless but may be mixed with mineral oils to advantage. The simplest and best method of distributing oil is by means of canvas bags about one foot long, filled with oakum and oil, pierced with holes by means of a coarse sail-needle and held by a lanyard. The waste-pipes forward are also very useful for this purpose.

ADDITIONAL FOR MASTERS.

HOW TO RIG A JURY RUDDER, &c.

1. If the pintles of the rudder were to give way, how would you act?

I would try to get the rudder on deck, and bore a hole about two-thirds down, through which I could reeve a short chain with a good rope pendant attached to each end of it; and again putting the rudder into its proper place, I would take the pendants in at each gangway and set them up with a good purchase leading forward to the windlass bits, and in this manner bind the rudder close to the stern-post, taking great care to have these purchases well attended to in order to keep the rudder in a right position. I should be obliged to allow it to hang in the shears on deck, having a strong iron bolt or crowbar through the rudder head thwartways to hang it by, thereby leaving it with the greatest freedom of action under such circumstances, taking care to have the shears well secured.

2. If your rudder was carried away what would you do first?

Bring the ship to the wind by bracing up the after yards, and meeting her with the fore yards as she comes to. Heave her to with just sufficient sail to steady her; if she falls off set some after canvas, and if she comes too close take in after canvas. A ship can be hove to or made to steer by easing head sails, flattening after sails and trimming yards to bring her closer to the wind, and by flattening head sails, easing after sails and trimming yards to keep her from sailing too close.

3. How would you make a jury rudder (wooden ship)?

Take a spare topmast, cut it to a sufficient length, bolt lengths of spars to this main piece, each shorter than the last, so as to form the shape of a rudder, then plank it over on both sides diagonally to make it stronger.

4. Suppose you had no spare topmast?

Then take the mizzen topmast; or, if a brig, the main boom.

5. Suppose you had no planks on board for planking it over with?

Strip the bulwarks.

6. How would you get the jury rudder placed?

Cross the chain around the main piece, about two feet from the heel, and cross another higher up, so that it will come just below the rudder trunk casing. Get a pair of shears rigged over the hole of the casing, pay out a warp down the trunk, bring the end in over the taffrail by the bight of a line thrown over it, pass this end of the warp through the hole for the tiller, take two half hitches round the standing part and stop the end, pass the other end of the warp through the block at the head of the shears, and lead it to the winch.

Hang a kedge to the heel and throw all overboard. Heave on the winch till the rudder comes up high enough through the casing; lead the chains at the heel forward to the fore chains, and the upper to the mizzen chains; bring them inboard and set them taut (see question 1).

7. How do you recover the kedge after the rudder is placed?

Make a sheep-shank, slip one bight over the heel of the main piece before it is thrown overboard, and fasten the end to the kedge; lay the sheep-shank along the main piece and stop it high up, When the rudder is in its place this stop is cut off, and the weight of the kedge slips the bight off the heel, and the kedge is brought in over the taffrail.

8. How do you protect the rudder trunk casing from the play of the rudder.

By bolting two spars athwartships, and other two over these, fore and aft, so as to partly cover the hole, and chocking up the four corners.

9. How would you prevent the chains from chafing your ship?

Nail battens on the parts where the chains would chafe and woold and serve the chains.

10. How would you rig a-jury rudder for a steamer?

As the trunk would be too small for a topmast to go in I should cut the main piece only long enough to reach its lower hole; shape the rudder as before; fix the main piece to a crosshead, and suspend it by a wire or chain down the rudder trunk casing, hung in a pair of shears. The upper chains will lead from the ends of the crosshead, but the lower chains would be cut to pieces by the screw, to prevent which, make the heel of the main piece lower than the rudder post, and have chain crossed lower down.

11. If you were within a day or two of your port, would you go to all this trouble?

No; I would get a long spar out aft, with chain round the outer end to weight it, and a warp or chain middled round the end; the parts brought to blocks at the end of boomkins or outriggers for the purpose; and so inboard to the barrel of the wheel or winch (Fig. 77).

12. How would you keep it off the taffrail?

Suspend it in the crutch of a small pair of shears aft.

13. The following is another plan for making a temporary rudder, which has been much approved by many experienced seamen.

Tow a large spar weighted with chain hanging in short bights, the bights being lashed together with small chain. A chain from each quarter is shackled on to one end of the spar to tow with, allowing just sufficient scope for the counter to clear when she pitches or scends. At the after end of the spar, steel hawsers are fast which lead through blocks at the end of outriggers to the steam winch. These hawsers are passed round the winch so that when the winch is turned, one part is being hove in and the other run out. The after end of the spar can be hove towards either quarter (Figs. 78 & 79.)

14. Jury rudder (Fig. 76).

Tow a spar (athwart) with a good steel hawser from each quarter. Have a few turns of chain round the spar to weight it, and a good chain or wire bridle from one end to the other. Bend the ends of the hawser to the bridle, so that there will be a short leg at each end of the spar.

The spar tows at right angles to the fore and aft line when an equal strain is on each hawser; but when the hawser is slacked away on one side and hove in on the other, the spar will shoot out on the same quarter as the heaving hawser, drawing the ship's quarter in the direction of the spar; consequently, when the ship's head is required to go to starboard the spar will have to be hove to the port quarter, and to the starboard quarter when altering course to port. One hawser will suffice, the middle round the steam winch and the ends made fast to the bridle. One hawser will also suffice for question 13.

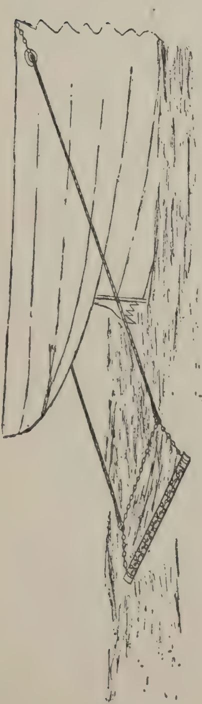


Fig. 76.

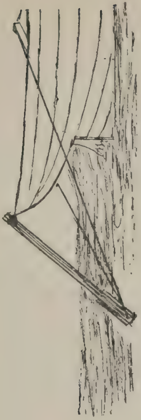


Fig. 77.

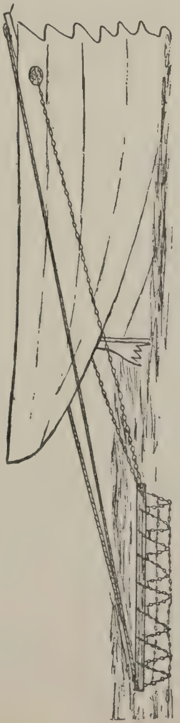


Fig. 78.

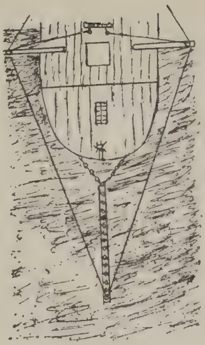


Fig. 79.

SEAMANSHIP.

1. How would you moor a ship in a bay or roadstead?

Having come to with a single anchor, I would endeavour to ascertain if the place was attended with any local dangers, such as a heavy swell, or strong sea setting in, or whether the wind was more boisterous from any one point than from others. On ascertaining this I would run out a kedge and lines in the direction I intended to lay the second anchor, which would be in such a place that, when moored, the ship might bear with equal strain on both anchors from the point from which most danger might be apprehended; then haul the ship out by the lines, veering away at the same time the cable of the anchor already down, to the end, If greater scope were required, I would bend on a warp, and veer away sufficient for the purpose, and then let go the other anchor, veering away the cable as the cable of the first anchor was being hove in, until the ship was in a good position between the two anchors.

2. Is this rule preferable in all places and under all circumstances?

No; there are places where the land is very high, and covered with snow for the greater part of the year (such as the coast of Anatolia on the south side of the Black sea, with many other places of the same nature), thereby causing the atmosphere to remain so cold, that although it may be blowing a gale of wind in the offing (where it is much warmer), directly towards the land, yet it no sooner reaches the land than it is repulsed or driven back by coming in contact with the coldness of the land; it will then be succeeded by light airs from the land, and squalls flying about in different directions; and a ship moored in the foregoing manner would be constantly turning round and round, having sometimes her stern and sometimes her beam to the sea, thereby causing her to roll very heavily, and in a manner that might prove very injurious to her, besides stopping all possibility of working cargo.

3. How would you moor her under such circumstances?

I would lay the best bower anchor to seaward, say, from the starboard bow, and the small bower or port anchor in a direct line towards the land, at the greatest distance my cables would reach. placing the ship in a good position between the two anchors. I would then have a good rope hawser out of the port quarter, made fast to the in-shore cable, at a short distance from the stern of the vessel, and by keeping this tight the vessel must consequently lay with the head to seaward, under all circumstances, or any change of wind, and will in this manner keep end on to the swell of the sea rolling towards the land. Provided, however, it comes on to blow from the land, or on either beam, very hard, slack down the hawser, and the vessel will instantly swing round head to wind, and is still properly moored.

4. How would you box-haul a ship?

Put the helm down, light up the head sheets, and slack the lee braces, to let her come to; as she comes to the wind, raise tacks and sheets, and haul up the mainsail and spanker; when she loses her headway, square the after yards, brace the head yards sharp aback, and flatten in the head sheets; the helm being down, will pay her off as she has sternway; as she goes off, keep the after yards lifting and square the head yards, shift the helm; when she gets the wind on the other quarter, haul out the spanker, set the mainsail, and brace the after yards up; as she comes to on the other tack brace up the head yards, and meet her with the helm.

5. On a lee-shore, by standing on, you must go on shore; you can clear the land on the other tack but it blows hard, with a head swell, and she will not stay; you cannot wear; how would you get on the other tack if you had good anchorage ground?

I should club-haul her; cock-bill the lee anchor, get a hawser on it for a spring, and lead it to the lee quarter; range the cable and unshackle it abaft the windlass; "*Helm's a-lee*;" raise tacks and sheets as for going in stays; as soon as she loses head-way, let go the anchor and when head to wind "*Mainsail haul*;" when certain she will pay off on the other tack, slip the cable, holding on the spring; when the after sails fill, cut the spring, "*Let go and haul*;" trim all to the wind.

6. If you had no anchorage ground?

I should box-haul her and let her come round on her heel. (Question 4.)

7. You are lying to in a gale of wind, and cannot show a bit of canvas, how would you prevent the ship from falling off?

Roll up a tarpaulin, take it to the mizen weather rigging, and let it go; the wind will unroll it and keep it firm.

8. You are scudding, how would you guard against the ship broaching to?

If scudding under the main topsail and foresail, I would keep the fore topmast staysail set, with the weather sheet hauled flat aft; but if under bare poles, and the ship was likely to broach to, I would haul my fore yards sharp forward to the wind, to meet her. In extreme cases, the bight of a hawser hung over the stern, with a good length of rope, has been found very efficacious.

9. If your masts were all cut away in a gale, how could you keep her head to the wind and sea?

By paying out a sea-anchor ahead.

10. Being totally dismasted, how would you act?

The nature of such a loss will not admit of any definite instructions being given, so much depending upon the situation of the vessel, and the circumstances connected with it, whether caused by a sudden squall of wind, or from a long and heavy gale; and also whether near the land, or a great distance from it.

11. What method would you use under these circumstances?

I should be guided primarily by the nature of the sea, whether running high or comparatively smooth; also by the position of the vessel, as regards her being near the land or having sufficient sea-room. Having sufficient sea-room and comparatively smooth water, I would take time and save as much as possible to rig jury masts fore and aft. In a gale and a strong sea, I would be obliged to cut much away to prevent the hull of the ship being stove, but should, if possible, try to save any spars that were not likely to damage the hull; any that would do I should get up aft to set a staysail or any other small sail, in order to keep the vessel's head to the sea, and with returning fine weather, I would rig the best jury mast I could with such materials as I had saved.

12. In case of your ship foundering, how would you provide for the safety of your passengers (if any) and the crew?

If I had passengers, I should on leaving port, tell off men to the different boats, and these men would be made to understand that they formed the permanent crew of the boats to which they were told off. I should occasionally exercise them in getting ready the boats, and make it the duty of each officer daily to see that his boat was in proper order, with everything ready, a plug and also a spare one made fast by lanyard close to each plug hole for immediate use; the rollocks with a lanyard to the foot of each passed through the rollock-hole and fast to the inwire or thwart of the boat, so that in an emergency there would be no searching for them: and above all, I would be sure that the boats' crews were trained for each man to look after the proper gear he had to use, so that every man knew his work in case of sudden necessity.

If my boats were lost previous to the catastrophe I should then set about making rafts, by taking three of the longest spars I could get, and forming a triangle of them; then cross these by others and lash them securely together, (some prefer to use four stout spars and make the raft square), cross these again by another layer, and so on till the spars are all used. If I had any empty casks, or water casks, or breakers, I would lash them to the undermost layer, and also rail the edges with small spars and ropes.

13. Name some of the things you would put on the raft?

Provisions, all the water I possibly could, arms and ammunition, sails and small lines to rig tents to shelter the crew, and a small yard with its sail to help the raft along.

14. If you were without water in the boats, how could you alleviate thirst?

By keeping the clothing damp with sea water.

HEAVING A SHIP DOWN, &c.

1. How would you heave a ship down?

I should first of all clear her of everything not absolutely required; and remembering that a part of my deck will be under water, I should have that part well caulked. I would have the masts fished, and shored from the waterways by two spars (with tom-shores in the hold under their heels) sheer fashion, well secured at the mast-head, and shores put in against the mast under the deck, to ease the strain on the partners on the under side in heaving down. I would get up as much preventer rigging as necessary; and if the vessel is likely to be difficult to heave down, I would get one or two outriggers out from each mast, taking the lower plank of the bulwark off, so as to rest on the gunwale, with martingales passed round the keel and made securely fast on the side to be hove down; lead stays from the outrigger ends to the mast head; lash the purchase-blocks aloft securely, the eyes of the block strop coming round the mast-head, and lashing on the same side as the block, as nothing can be too well secured in heaving a ship down. After I had got the preventer rigging well and equally set up, I should wedge the shores up till the main strain is taken off the standing rigging, so that all the preventers bear equally with it. I should then endeavour to get a pair of spare pumps to put down the hatchways into the lee bilge, to pump the ship out whilst hove down; but if I could not procure a pair, I would take the ship's pumps out, and use them for the purpose. When I had got all ready for heaving down, I would moor her head and stern with an anchor at each end, laid well on the side to be hove out, with the stream chains fast to the anchors, I would pass them under the bottom, and make them securely fast to the side to be hove down, which would keep the ship from closing in on the vessel, lighter, or quay she had to be hove down by; and if I was going to heave down to a ship or lighter, I would moor her with anchors, directly opposite the ones I had laid down, so that the ship or lighter may keep fair in heaving down.

2. After you had effected the necessary repairs, how would you ease your ship up again?

I would man the heaving down capstans, and walk them back, so as to ease the ship up regularly without jerking the masts, as lowermasts are more liable to be carried away in easing the ship up than in heaving down by the jerks in surging the falls, if you do not walk steadily back with the capstans.

3. If you had to heave down by another vessel not prepared for the purpose, how would you secure your lower blocks to bear the necessary strain without injury to that vessel?

If the vessel had hatchways the same distance from one another as the masts of the ship to be hove down, a heavy spar secured under the lower deck beams with diagonal shores, would answer for the lower blocks to be lashed to; but if the vessel is much smaller than the ship to be hove down, the most secure method not to injure the vessel is to pass sufficient turns of hawser entirely round the body of the vessel at a proper distance for each of the lower blocks, and pass swifter lashings through the parts of the hawser, outside the gunwale on each side, secured to the exact distance, so that the hawsers may not slip apart by the shape of the vessel in heaving down. In heaving the ship down, if I found her coming down very easily, I should pall the capstans, and have tackles got up to the mast heads to prevent the ship falling too far over after losing her bearings, as ships of a certain build are liable to do.

4 Suppose the ship does not rise, what would you have done, before heaving her down, to meet this emergency ?

I would have taken a warp, middled it, and passed it under the ship, so that the bight is on the side to be hove down ; then pass the ends through the bight, and so clinch it on the lee side. Then if the ship wont rise, I could parbuckle her up with this warp.

5. Is there any other way of helping up a ship that will not rise ?

Yes ; rig a derrick on the barge, and lift her by her masts

6. If you had to heave her down, say two miles from the shore and no barge ?

I would make a raft, moor it well, and weight it as heavily as possible. The lashings for the purchase blocks to go all round the raft.

MANAGEMENT OF A SHIP ON THE STRAND.

1. Riding at anchor on a lee shore, with no possibility of getting under weigh, what would you do ?

I would slack both cables out to an end, provided I had sufficient room to do so, and have a good purchase on the cables abaft the windlass leading well aft. These purchases, set well tight, would greatly ease the strain on the windlass. I would also send down the topgallant yards and masts.

2. Finding the anchors still coming home how would you act ?

I would let go the stream anchor, with the best hawser fastened to it ; send in the jib-boom ; send down the lower yards and topmasts ; and if, *after due consideration*, I found it to be expedient, I would cut away the lower masts.

3. Having done all this, still your cables part, and the ship drives on shore, what would you do ?

My first consideration would be the preservation of the lives of all on board, and afterwards as much of the property as possible.

4. In what manner would you proceed ?

The means necessary for the preservation and recovery of ships stranded do not admit of being limited to definite rules that can be applied to all cases of misfortune, which seldom occur under the same circumstances, are of the same nature, or to the same extent. The size of the vessel, the position in which she lies, the nature of the ground (whether composed of rock, gravel, or sand), whether the ship is in ballast or loaded (if loaded, the description of the cargo), and many other circumstances, require the greatest consideration, for deciding the means to be adopted, as the urgency of the case may require, independently of the state of the weather, by which the operations must, in a great measure be directed and influenced. On the entire seaboard of the United Kingdom there are not to be found two neighbouring bays or beaches to which the sea flows with equal force, or to equal depth. The declivities of the shores are more or less acute or precipitous, and the sea, in consequence, is more or less resisted in its approach, and precipitate in its retreat. It would therefore be absurd to prescribe specifically the course to be pursued in the various cases of shipwreck, which alone can be suggested by experience, and will much depend on promptitude, activity, and perseverance for ultimate success.

5. Suppose your ship is stranded on a sandy beach in the United Kingdom, how would you act ?

Having got on shore as much of the cargo (if any) and tackling of the vessel as possible, I would place them in a store, or any other suitable place, provided such place could be obtained. If not I would rig tents with the ship's sails, and stow the materials therein.

6. Would you not deliver them over to some agent (who might be on the spot), to take charge of them, and see them attended to ?

No ; I should have no authority to do so ; but as soon as practicable after getting on shore, I would communicate with the owners of the vessel and the owners of the cargo, stating full particulars of every circumstance relating to both the ship and cargo, and retain full power, and hold command over all things connected with the ship and cargo, until I receive a reply, and on receiving it, I should most likely be advised how to act, and would act accordingly.

7. Your orders are to endeavour to get the vessel off, how would you proceed ?

As a general rule I would endeavour to get the vessel's bows on to the sea, by putting ballast or some other heavy weight close forward, thus keeping the fore end of the vessel down, while the after end is allowed to remain light ; the action of the sea might then drive the after end up towards the land, while the fore end, by being well ballasted, would remain stationary. If this did not succeed, a good purchase from the shore to the after part of the vessel might be used at the same time with success ; then if the vessel was but slightly damaged, I would caulk the ceiling, or put in bulkheads or other matter required, provided a place of safety were near at hand where the vessel might be taken into and repaired If not, I should be obliged to be more particular in the repairs, in order that the ship might be taken to a greater distance ; or she might be raised upon ways by screws if the tide ebbed far enough out ; if not, by floats, and afterwards launched in the same manner.

The following are the means which were adopted with success for the purpose of getting a vessel off the strand on the north coast of Scotland, the vessel having parted from her anchors during a strong gale. A short time after leaving the vessel, she fell over on her broadside with her keel to seaward and her bows at an angle of about 45° more towards the sea than her stern ; she lay about midway between high and low water marks. On the tide leaving her, the port side was quite embedded in the sand, and the keel fully six feet above the level of the sand The vessel being in ballast, it was of course thrown over to the port, or rather to the bottom side of the vessel, helping in a great measure to hold the vessel down, and keeping her from being knocked about by the action of the waves, so much as she might have been without it. On examining the vessel it was found that the after keel and stern post were gone, with other damage. The first business was to get everything that was moveable from the wreck, which was accordingly done and put into tents at a convenient spot near the vessel. The hull of the vessel was next commenced with. Carpenters were employed to repair the damaged parts in a temporary manner, yet sufficient to make her watertight: at the same time a platform was rigged in the middle of the ship, with the topmast, jib-boom, ballast-boards, and other materials; the ballast was then got up from the bottom, and laid on this platform; the cable chains were lashed alongside the starboard, or rather the upper side, to act as a balance against the weight on the port or lower side of the vessel, the greater part of the weight being put well forward. This being done, the main boom was set as a shore against the foremast head, in order to keep the vessel as steady as possible, which is a point that should be well attended to, for should a vessel on the strand be allowed to shift about with the action of the sea, the damage will be greatly increased. While the vessel was lying in this manner a gale of wind set in directly on the land, with a long heavy swell; and as it happened to be spring tides, the water rose to a great height, thereby causing the sea to strike the vessel with great force. Now while the fore part of the vessel remained fixed and immovable by reason of the shore against the foremast head and the weight of the ballast forward, every swell moved the after end more or less, driving it up little by little, till at length the vessel fell over into her own dock right on her keel, with her bow to the sea, the exact position best suited for getting her off the strand; all the ballast was then put close forward, and the bow-ports taken out, allowing her to fill and empty herself with the flow and ebb of the tide, to keep her in that position while other necessary work was being done in order to heave her off. Accordingly anchors were carried out, with purchases forward and to each quarter of the vessel. Having made all ready the ballast was thrown overboard, the ports put in, ship pumped out, and at high water hove off and taken into a small harbour near at hand and repaired, during which time one of her anchors and chain were picked up.

8. Would you act in the same manner in foreign ports?

Yes; in those parts where instructions from the owner of the vessel would not reach me in time, so as not to cause delay, or prove injurious to the property under my command.

9. If you were at too great a distance to correspond with the owner, what would you do?

I would have a survey made by an experienced shipmaster and a merchant or shipbuilder, if such persons were to be obtained; if not, I would be guided by my own judgment, with the assistance of the most experienced men I could find, and abide by the decision then made.

10. If your vessel were driven among rocks, what means would you take to save the lives of all on board, and part or the whole of the cargo, if practicable?

If the rocks were near the shore, or above water I would get the end of a good hawser made fast to the shore or to the highest rock within reach of the vessel, making the other end fast on board, and set it well tight with a good purchase, on which I could construct a traveller, with a chair or something of the same nature slung to it, and in this manner haul the passengers, crew, and property on shore.

11. How would you get the end of the hawser made fast to the shore?

In all probability there would be people on the shore to make it fast. I would send it to them in the following manner:—By making a cork fender or some other buoyant substance fast to a small line, (such as the log line or lead-line), it would, on being thrown overboard, drive on shore with the small line; a larger line might then be hauled to the shore, and afterwards the hawser. If the place were uninhabited, other means might be used; I would endeavour to get on shore by swimming, with the assistance of a life-buoy, or in a boat, or in any other manner which circumstances might suggest or permit; and as it is not probable that the vessel could be got off a bed of rocks, I would get what I could from her.

12. Suppose the land inhabited, but the shore high and precipitous, so that no communication can be held between the foot and top of the cliff, how would you endeavour to open a communication with the people on the top?

It could not be done by floating a line ashore, nor by a man swimming; the line must be sent up into the air, this can be accomplished by means of a kite. Take a light hoop, but if you have none handy, take three light pieces of wood and bind them strongly together in the shape of a triangle, and cover it with canvas; attach three or four pieces of strong cord at equal distances to the wood, and fasten the ends securely to a light line. The shore being a lee shore, the kite will be driven by the gale shorewards. If it reaches the top safely, proceed as before described.

There is a kite patented by Captain Nares, R.N., with everything ready for instant use, and may be obtained at any port.

13. If the vessel struck on a bed of sunken rocks, what would you do ?

I would take to the boats, having them stowed with provisions and water in the best manner circumstances would permit. If the boats were disabled, I would construct a raft.

HOW TO RAISE A SUNKEN VESSEL.

14. How would you raise a sunken vessel ?

I would sling her with good cables, and raise her between two or more vessels, or floats constructed for the purpose.

15. How would you sling her ?

Having ascertained the position in which the vessel was lying I would sweep each end of her with the bights of two cables of sufficient length to allow the ends to remain above water. I would then take two other short pieces of cable, (about two-thirds of the length of the vessel,) and make a large link at their ends, through which I would reeve the ends of the first mentioned cables, and allow the short pieces to sink to the bottom one on each side of the vessel, they would then act as bridles by connecting the end cables, all being thus united, would securely sling the vessel and the greater the strain on them, the tighter they would grip.

16. Having slung the vessel how would you proceed to raise her ?

The power of buoyancy must be regulated by the weight to be raised. The general principle, however, under which I would act, would be to place two vessels, one on each side of the sunken vessel as near to her as possible. I would then place two logs of timber directly over the sunken vessel, with their ends resting on the decks of the vessels used to raise her, and having their decks and beams well fortified to bear the pressure. The ends of the slings must then be made fast to the logs of timber, and hove tight up at low water. As the tide returned all would rise with it, (that is, if the power of buoyancy were sufficient for the purpose), then at high water, all should be hauled into shoaler water, till the sunken vessel again takes the ground ; and so on every tide till the sunken vessel could be seen. The logs of timber must then be dispensed with, and the slings made fast to the vessel without them. Where there is no tide, or there is little rise or fall, the vessels which are used to raise the sunken vessel must be loaded before being hove down, and afterwards discharged; as they rise out of the water, they will lift the sunken vessel in the same manner as when lifted with the tide. They might be filled with water and pumped out if consistent with prudence.

The above method is seldom used now, as the modern salvage boats have appliances for patching all holes, and powerful pumps sufficient to float most vessels.

MISCELLANEOUS QUESTIONS.

1. If you had to slip from the Downs, wind from the SW, what would you do?

I should set my three topsails, foretopsail aback; foretopmast staysail weather sheet aft, have other sails loosed and ready for setting, and a spring from my starboard quarter. Buoy the cable and slip, and when the ship is sufficiently round, cut the spring and fill away. Bring the high light over the middle of Old Stairs Bay.

2. In a steamer loading in an open roadstead, what would you do?

Have the fires banked and get everything ready for slipping, if necessary.

3. Your ship is on shore, listed with her decks towards the sea, what would you do?

Try and get her listed with her decks towards the shore, by shifting cargo or heavy weights, or try and get her head on to the sea.

4. What would you do if you were in collision with another ship?

Ascertain at once if the ship is likely to keep afloat, stand by the other ship and render any assistance that may be necessary, the other ship will have to do the same; ascertain her name and port of registry.

5. What is spontaneous combustion?

The ignition of a body without any external flame, it is generally caused through moisture.

6. What cargoes are liable to spontaneous combustion?

Jute, flax, hemp, wheat, cotton, coal, grass, &c.

7. You are in a light steamer short of coal in the middle of the North Sea, gale of wind right ahead, what would you do?

Unshackle the cables from the anchors and pay them out, ride to the cables until the weather moderates.

8. Entering the Tyne or any other narrow entrance with a gale of wind right in, what would you do?

Go in with plenty of way on the ship. The best time to enter would be about high water.

9. How would you test the stability of a new ship loading coal?

Team a waggon or two at one side, and note what she goes over, then team the same quantity on the same side; if the stability be good the ship will not go over so far with the second lot of coal as she did with the first.

10. What would you do in a broken down steamer, on her beam ends?

Get her head to sea with a sea anchor, and if possible trim her upright by shifting the cargo.

11. How would you tell the quantity of coal a bunker will hold?

Multiply the length, breadth and height, and divide by 45, will give you the quantity in tons for ordinary bunker coal.

12. What would you do if the key of the propeller was loose?

Avoid coming astern and ride to a sea anchor if she is likely to race in bad weather.

13. How would you get a tow line on board of another ship in a heavy sea?

Get to windward and drift a life-buoy or anything that will float a small line to him; or fire a rocket with a small line attached to it.

14. How would you take the crew from a disabled ship?

Steam to windward and launch the boat with all the necessary gear in her, using plenty of oil. The boat will be able to run before the sea to the disabled ship, and the time she is taking the crew off I can steam to leeward and wait of the boat returning.

15. How would you take a turn out of the cables?

Lash the two cables together as low down as necessary, unshackle the one I am not riding by, and pay it out of the hawse pipe, take the turns out; pass it up through the hawse pipe again, and shackle on.

16. You are coming North along the Yorkshire coast in a light steamer, NE gale of wind, the ship is gradually sagging down on to the land, she will not stay and there is not room to wear, what will you do to get her on the other tack?

Full speed astern, the wind and sea will pay her bow off towards the land; when there is sufficient room, go ahead with the helm hard a starboard, bringing the wind on the port bow.

17. You are going with the flood tide, and see a can buoy on your starboard bow, what would you do?

Hard a port and bring it on my port bow.

18. How would you make a report on a damaged ship, if called upon to do so?

I would state all, even the smallest things and parts damaged; then the words "lost, damaged, or destroyed; and we further recommend that these repairs be carried out" or words to the like effect.

19. How would you report on a damaged cargo?

State how it was stowed and dunnaged, the damage done, with marks and numbers of the packages; and "we recommend that the damaged goods be sold, and the rest re-shipped."

20. You are in a light steamer on a lee shore; it is impossible for her to work off either on the port or starboard tack; is there anything you can do to save the ship?

Take the manhole door off the after tank, and run the after hold up with water to about the tunnel top.

21. You are lying moored bow and stern in a tier, tide ahead; what would you do if the bow moorings parted?

Let go the anchor, pay out cable and let her swing to the stern moorings.

22. How much cable would you pay out when turning a steamship round the anchor?

About three times the depth of water.

23. You are going into a bay, light steamer, strong wind aft, you find that you have to come out again and she won't turn round; what would you do?

Bring her full speed astern, and let her come out stern first.

24. Wind SW. in North Atlantic; if the wind shifts, what direction will it likely blow from?

NW.

25. What would you do if your funnel was carried away?

Rig a jury funnel with all the spars, planks and boards I could get, and cover the outside with canvas.

26. What would you do going into a roadstead blowing hard, (light steamer).

Pick out a good berth; steam towards it and drop the anchor; then let her swing whichever way the wind and tide will allow her.

27. You are lying in a tier, ships on each side of you, tide aft; how would you get out?

Go out head first; the other ships will slack their head moorings, if necessary.

If the tide was ahead, drop her out stern first.

28. How would you warp a steamer up a dock?

Have two warps forward and two aft; when heaving on one of the forward warps, the other can be run out to the next buoy further ahead, and when slacking away on one of the after warps, the other can be run out to the next buoy. Always have one warp fast before the other is let go.

29. Ship lying stopped in a tide way, no wind; she is by the stern, how will she lay with the tide?

As the stern is the deepest end, the tide will have more effect aft, and consequently she will lay with her head towards the tide.

If she was by the head, she would lay with her stern towards the tide.

30. How would she lay if there was only wind and no tide?

She would lay stern towards the wind when by the stern, and bow towards the wind when by the head.

31. Your ship is ashore, wind on to the land, all boats are gone, no one on shore; how would you land?

Lash three spars together in the form of a triangle, lace between the spars with rope; launch the raft, a few hands get into it, the wind will blow it on shore. If the ship is not too far from the shore, the raft can be hauled back to the ship, other hands get into it and these on shore can haul it back.

32. Your ship goes on to a sand bank, get her off ?

Sound round the ship and sound seawards, run a kedge in the direction where there is sufficient water, then run off a bower anchor, hauling out to the kedge. Heave her off with the bower ; part of the cargo may have to be jettisoned, or you may have to wait until the tide rises.

33. Your tiller is carried away or the quadrant broken, what would you do ?

Rig a jury tiller, by lashing a good spar or iron bar to the remaining part.

34. What would you do in a case of sickness ?

Ascertain the symptoms and consult the medical guide, so as to try and make sure of the nature of the sickness.

35. Making a passage from one port to another, what would you be particular about in a steamer ?

Make sure that I had a few days extra coal, and if it is a time of year when head winds are likely to ensue, more allowance still will have to be made.

36. You are in dock, and get a wire round your propeller, what would you do ?

Heave on it and try to get it clear ; whilst heaving, the engines may be reversed a turn or two. In all probability a diver will have to be employed, and if he cannot get it clear, the ship will have to be docked, or cargo will have to be discharged to allow the boss of the propeller to come to the surface.

37. Railway iron adrift in the hold, what would you do ?

Tom it off the best way I can. As the iron works towards one side, drop the toms or chocks into the spaces where you can get them ; do likewise when it works towards the other side until you have it secure. The booms will likely have to be sawn up for toms.

38. You are in a sailing ship laden with railway iron, she is thrown on her beam ends and cargo shifted, what will you do ?

Cut away the masts and let them go over the lee side. When clear of all the wreckage, get out a sea anchor and try to righten the ship.

39. How would you tell the rate a tidal wave was travelling along a coast ?

Note the time of high water of two different headlands, and the difference between the times of high water will be the time the wave travels from one headland to the other.

40. You strike a rock and damage your forefoot; water is coming in, what will you do ?

Fill up with plenty of cement, board the cement over and shore it securely down.

41. How would you discharge cattle lying 16 feet from a quay ?

Rig a good gangway for them to walk on shore.

ICE LIMITS.

North Atlantic.

Lat. 39° N. between Longs. 40° and 50° W. the Strait of Belle Isle cannot be navigated until the end of June.

South Atlantic.

Ice as a rule is never seen to the Northward of 37° S, it has been seen (but very seldom) as far as 36° S.

About one-eighth of an iceberg generally appears above water.

FOGS.

British Islands.

January and June are the foggiest months, except in London where November is.

Banks of Newfoundland.

June and July, worst months.

Bay of Fundy.

Most prevalent in July and August.

Fogs are also prevalent at Cape Verde Islands in the summer ; West coast of Africa in the winter ; North of the Equator and South of the Equator in June, July and August ; Rio de la Plata July to September ; Peru, April to about August ; Vancouver June to November ; California during the summer ; China, winter, and Japan summer.

LOWER MAST SPRUNG AT SEA.

Fish it with the best spars I have got, using the small spars to fill up contlines with ; lash it with rope and chain lashings alternately, and wedge it.

Look to it every day, more particularly after severe weather.

LEAK IN SCARF OF THE STEM.

Make a stopwater; that is, bore an auger hole through the inner end of the scarf, and drive in a treenail, (wood ship.)

EXPLOSIVES.

1. What general precautions must be taken in shipping explosives?

The Board of Trade "stipulate for a substantial compartment formed of double boards, with an intermediate lining of felt," or they must be otherwise carefully stowed so as not to come in contact with or be in danger from any other part of the cargo; hence, they must be isolated by boards or surrounded by sail-cloth or felt, to prevent the powder getting adrift during the voyage.

SHIP'S BUSINESS.

Invoice, Charter Party, and Bill of Lading.

1. You are appointed Master of a ship, what is the first thing you would do on taking command?

Get all the ship's papers from the last Master, and enter a list of them in the Official Log Book, and sign it myself, and get the late Master to sign it also; take the ship's Register to the Custom House and get my name put on it if in a British port, and to the British Consul if in a foreign port.

2. What is a Charter-Party?

A written contract entered into by a Merchant and a Shipowner (or the Master), for the hire of a ship for a specified time or voyage. The Owner contracts to supply a stout ship, properly supplied with the necessary stores and provisions, and properly officered and manned. The Merchant contracts to supply cargo and pay certain freight for the use of the ship.

3. What would you be careful to see was in the Charter Party?

The freight, lay days, and demurrage days for loading and discharging, and the rate of demurrage.

4. What are lay days?

Days allowed for the ship to load or discharge in. Sundays and Holidays do not count, unless the phrase "running days" is mentioned, when all days count.

5. What are demurrage days?

Extra days for loading or discharging, when the Merchant has, from any cause, been obliged to detain the ship over the lay days. Sundays and holidays to count.

6. Your ship is ready to receive cargo, what would you do?

Have my ship moved to the place specified for receiving the cargo; then give a written notice to the Merchant that I was ready to receive cargo and should come on my lay days the next day, and enter a copy of this notice in the ship's log.

7. When the goods come on board, what document comes with them?

An invoice; which is often called a boat note.

8. What is an invoice?

An account of the goods shipped, with their marks and numbers, the name of the vessel and the master, the port of destination, the name of the consignee, and a description of the goods, with their cost and charges.

9. How many invoices usually come off, and what becomes of them?

Two. The mate signs one, and gives it back, and files the other.

10. Your lay days have expired, but the cargo is not all on board, what would you do?

Give a written notice to the Merchant, informing him of the fact, and advising him that I shall come upon demurrage the next day; then enter a copy of the notice in the ship's log.

11. How is the demurrage to be claimed?

Day by day, and on Saturday for Saturday and Sunday.

12. In the Charter-party you promise that the goods shall be delivered at the port of discharge in the same good order in which they are received on board; what is the exceptional clause put in?

"The Act of God, the King's Enemies, Restraints of Princes and Rulers, Pirates, Fire, and all and every other Dangers and Accidents of the Seas, Rivers, and Navigation, of what nature and kind soever, during the said voyage, being always excepted."

13. If it were a steamer, what additional clause would you have?

"Accidents from boilers or engines."

14. What makes the Charter-party legal ?
The stamp.

15. Does a Charter-party entered into abroad, where no stamp is required, require one when it reaches England ?
Yes : a sixpenny stamp must be put on within a week of its reaching the United Kingdom.

16. What makes it binding ?
The penalty clause ?

17. What is the penalty clause ?
"The penalty for the non-fulfilment of the contract to be the estimated amount of freight" ; sometimes a stipulated sum.

18. Who cancels the stamp ?
The person who signs last.

19. Who signs last ?
The last contracting party.

20. How do you cancel the stamp ?
By writing my name across it, and dating it.

21. What is the penalty for not cancelling a stamp ?
Fifty pounds.

22. When is the Charter-party considered to be complete ?
When it is dated, signed, and the stamp cancelled.

23. When the cargo is all on board, what document has the master to sign ?
The Bill of Lading.

24. What is the Bill of Lading ?
The master's receipt for the goods on board, and his promise to deliver them in the same good order in which he has received them.

Note —As the Bill of Lading is the master's receipt, he should naturally make it out himself from the invoices filed by the mate ; but it is the general custom for a clerk in the merchant's office to make it out, and the master goes to the office, checks, and signs it.

25. What is meant by a set of Bills of Lading ?
Three or more copies of the same all stamped, and signed by the master.

26. How are they distributed ?
One is sent by post to the consignee, one is kept by the master, and the rest by the merchant.

27. There being so many Bills of Lading, is there not a risk of having two or more presented to you at your port of discharge?

No; there is always a clause in the Bill to this effect:

"In Witness whereof, the master or purser of the said ship hath signed Bills of Lading, all of this tenor and date, one of which being accomplished, the others to be void."

28. What is the "exceptional clause" in a Bill of Lading?

The same as in the Charter-party:—The Act of God, &c., &c.

29. What is the general clause?

"Contents, weight, quality, and quantity unknown."

30. What special clause would you have in it?

Freight, demurrage, and all other conditions, as per "Charter-party" dated ———.

31. What extra clause would you have in for a steamer?

"With liberty to call for coal at any intermediate port or ports; to sail with or without pilots; and to tow and assist vessels in all situations of distress."

32, What would you do before signing the Bill of Lading?

Read it carefully over, and see that nothing in it was contrary to the Charter-party; see that all the goods mentioned in it are actually on board by comparing it with the Cargo Book; get back the mate's receipts; see that the necessary clauses are in, and write any remarks opposite the different items that I thought the case required, to limit my responsibility.

33. Suppose the Bill of Lading specified that you had 500 tons of iron on board, what would you write opposite to it?

Weight unknown.

34. One hundred sets of polished fire-irons?

Not accountable for damage through rust.

35. Grain?

Quality, and quantity unknown.

36. Cargo consisting of such things as bales of hemp, flax, &c, ?

Weight and contents unknown.

37. Barrels of beer, wine, or any liquids in casks ?

Quality, quantity, and contents unknown ; not accountable for *leakage.*

38. Cases of wine ?

Quality, quantity, and contents unknown ; not accountable for *breakage or leakage.*

39. Crates of earthenware or glass?

Contents unknown ; not accountable for *breakage.*

40. Six chests of silver ?

Weight and contents unknown.

41. Suppose you take goods at a reduced freight, but with the understanding that they are to be used as dunnage, what would you write opposite ?

Shipped as dunnage.

42. If live stock ?

Not accountable for *accidents or mortality.*

43. What extra precautions would you observe if the goods were to be delivered in an open bay ?

I should, besides the above remarks, write—"To be taken from the ship's tackles at the risk and expense of the consignee," unless I was paid extra freight for taking the risk on myself.

Bill of Health.

44. Before sailing for a foreign port, what document must you get ?

A bill of health, and have it endorsed by the Consul of the country I am bound to.

45. Where do you get this bill of health ?

From the health officer of the port, if there is one ; if not, at the Custom House.

46. What is a bill of health ?

A certificate stating the general good health at the port of departure.

47. Suppose you had no bill of health ?

The ship on arrival would be placed in quarantine, and much delay and trouble ensue.

48. Where do you get the bill of health in a foreign port ?

From the British Consul.

Manifest.

49. What is a manifest.

It is a document dated and signed by the Master, and should contain the name and registered tonnage of the ship, her port of registry, the master's name, a list of crew and passengers (if any), an account of all the packages on board, with the marks and numbers thereon, and the contents; the names of the place or places where the goods have been shipped, and their destinations; also the names of the respective shippers and consignees.

In many foreign ports a list and description of the stores, materials, provisions, and private effects, &c. on board the ship are also required.

After Sailing—Survey, Protest, Bottomry, Respondentia, Dead Freight, Bill of Exchange, &c.

50. You have left port, what would you do before the pilot left you or before the tug cast you off?

Muster the crew aft, and send a list of the absentees (if any) to my owners and to the Shipping Office. (E.N.G.)

51. You have bound yourself to make the best of your way to your port of discharge, may you deviate from your course?

Yes: to avoid an enemy; severe weather; to obtain necessary repairs or provisions; or in case of sickness breaking out amongst the crew.

52. Suppose you enter a foreign port to land a man sick or disabled, describe how you would proceed?

I should enter with the quarantine flag flying. The proper officer would board me, and after examining the sick man and the whole of the crew on board, and finding nothing infectious would permit me to land, I should go to my Consul and get permission to send the man to the hospital, then land him. I should have to take the ship's articles on shore to the Consul, and leave a proper discharge for the man, and whatever sum of money the Consul should demand for the man's keep and expenses; the balance, if any, will be returned to my owners; and if I wish to ship a man to fill the vacancy, I must ship him before the Consul; afterwards sail with the first opportunity.

53. Suppose you have put in with decks swept and bulwarks gone, &c., what would you do?

Report myself to the port authorities and to my Consul and note a protest.

54. What next?

Call a survey on my ship.

55. Whom would you call on this Survey?

Two shipmasters, or other experienced persons.

56, Are you bound to call Lloyd's agent?

No.

57. May you call him in?

I may; not as Lloyd's agent, but as a private person well qualified for the work.

58. What should surveyors put in their report?

"Lost, damaged, or destroyed."

59. Suppose the Surveyors order you to discharge, and your repairs will take some time, what would you do with the cargo?

Hire another ship to take it on.

60. You cannot get another ship?

If a perishable cargo, sell it; if not, warehouse it. I should telegraph or write home to my owners, informing them what I had done.

61. In all cases, what should you do before breaking bulk?

Call a survey on my hatches.

62. Whom would you call?

Two shipmasters.

63. Upon discharging cargo you find some damaged, what would you do?

Call a survey on it.

64. Whom would you call?

Two merchants who are acquainted with the kind of cargo.

65. What would they report upon?

Whether the cargo was properly stowed and dunnaged, and the amount of damage.

66. What would you do after receiving their report?

Extend the protest.

67. In extending a protest, what must you be very careful about?

To see that nothing is put in it that cannot be proved by the ship's log.

68. If you were in a steamer, and had gone in with machinery damaged, whom would you call on the survey?

A shipmaster and an engineer.

69. Suppose you had no money to pay for the repairs, how would you set about getting it?

Telegraph or write to my owners, if I could do so.

70. Suppose you are too far off to do so in a reasonable time, what would you try next?

To raise the money by a bill upon my owners.

71. You cannot succeed in so raising it; what next?

Try to get it on a bottomry bond.

72. What is a bottomry bond?

Raising money for the necessary repairs of the ship upon the ship as security.

73. What is the difference between a bottomry bond and a mortgage?

A bottomry bond is entered into by the master. The money so raised must be spent upon the necessary repairs of the ship only, and be repaid with interest on the completion of the voyage.

A mortgage is entered into by the owner. The money raised may be spent as he likes, and the interest and principal paid at the times stated in the deed.

74. How would you proceed to get a bottomry bond?

I would advertise, and accept that offer which was for the lowest interest.

75. How many bottomry bonds may a ship have on one voyage?

As many as may be necessary to carry her to her final port of discharge.

76. Show what you mean?

Ship gets a bottomry bond at port A, and then sails. She again meets with bad weather, is damaged, and calls at port B, where she gets a second bond, and after repairs, sails again. She again meets bad weather is damaged, goes into port C, gets a third bond, repairs, sails, and reaches her final port of discharge.

77. How are these bonds paid?

The last first, and so backwards. C, B, and last A.

78. Supposing the ship had been lost after leaving port C?

Then the principal and interest of all the bonds would have been lost.

79. Supposing you could not raise money by a bottomry bond, what could you do?

Try to raise it on the cargo (respondentia). If I could not get it by that means, then I would be obliged to sell sufficient of the cargo to raise the necessary money.

80. Is there anything payable before a bottomry bond?

Yes; seamen's wages.

81. What is meant by Respondentia.

The pledging of the cargo to pay for the necessary repairs of the ship, when the money cannot be obtained by any other means.

82. Your repairs are completed, what would you do?

Call a survey upon the repairs, so as to have a report that they are properly executed and that the ship is in a seaworthy condition.

83. Why is this necessary?

To satisfy the Insurance company.

84. And then?

Make the best of my way to the port of discharge.

85. Is there any precaution that you, as a careful shipmaster, could take for your owner's interest before sailing?

Yes: I would make out a list of all my disbursements upon ship and crew while at the port, and send it to my owners by post, with copies of the necessary vouchers.

86. On arrival at your port of discharge, what would you do?

Report myself to the port authorities and to my Consul and note a protest; and then look up my consignee.

87. To whom would you deliver the cargo?

To the legal owner of the bill of lading.

88. How would you know that the consignee legally held the bill of lading?

By the endorsement.

89. Whose name would be on the back?
The original shipper's name.

90. What difference is there between the bill of lading as it left your hand on signing it, and when you see it again in the consignee's hand?

It will now bear the endorsement of the original shipper.

91. Supposing you could not find the consignee, what would you do?
Advertise for him.

92. How long would would you advertise?
During my lay days.

93. What would you do with the cargo?

Discharge it into a warehouse. If the consignee turned up, he could get it upon paying the charges; if he were still not to be found at the end of the lay days, then if it were a perishable cargo, I would sell it; but if it were not, I should get some responsible person to advance the freight and charges, he holding the cargo as a security till the consignee appeared, or instructions could arrive from the original shipper.

94. In the last case, would you not be obliged to lay the demurrage days?
No.

95. In all cases of dispute, detention, or difficulty, what should you do?

Write home to my owners a full account of the case, with copies of any documents.

96. What precautions would you take with reference to bills, vouchers, protests, &c., before leaving port?

I would enclose verified copies in a letter to my owners.

97. Suppose a merchant had stipulated to supply a full cargo, but finds he cannot, what would you do?

Have the unfilled space measured, calculate the freight I should earn upon that space, and claim the amount from the merchant as "dead freight."

98. Suppose he refuses to pay, have you any lien upon the cargo already in for this "dead freight"?
No.

99. How can you recover the money then?

Only by going to law to enforce the penalty clause in the charter-party.

100. Describe how you would act if thus left, with only a part of the promised cargo?

As before stated, I should measure the unfilled space and calculate what freight I should earn on it; then I should try to find another freight for the space; and if the rate of freight is against me, I should claim the difference from the first party; taking care to refuse anything that would damage the cargo already in.

101. When you go to sign the bills of lading and you find more put down than is on board, what would you do?

I would object, and if he persisted in keeping the wrong amount, I would sign "so much" or "so many" in dispute.

102. If he won't let you, and will have a clean bill signed?

I should get three blank bills, fill them in myself for the amount on board, sign them, give the merchant two of them, and proceed on my voyage.

103. If your ship is chartered for a lump sum, what would you be very careful about?

To see that she was not too deeply laden.

104. How would you do that?

By having the draft she is to be loaded to stated in the charter-party, which should not be below my load-line mark.

105. You are offered a charter in a foreign port for a place you were never at; what would you do before accepting it?

Ascertain full particulars about the place; if my ship can always lie afloat; whether to be afloat I must lie a long way from the shore; the prevailing winds and storms; whether ships there have often to slip; port charges; and its capabilities for food, fresh water, &c.

106. You are kept on demurrage abroad; what would you do when you got your bill of lading back?

Write on it the number of days I have been on demurrage.

107. What is a common bill?

It is a written agreement on stamped paper, in which the debtor agrees to pay his creditor, on a day specified, the sum of money which he owes him.

108. Here is a form of one; explain it?

£250. *Sunderland, November 6th, 19—*

Sixty days after date pay to me or my order the sum of two hundred and fifty pounds, value received.

SAMUEL HORN.

To Mr. William Cross, Merchant,
Sunderland.

This bill was drawn on Mr. Horn by Mr. Cross, who owed him the money, and Mr. Cross accepted it by writing his name and the word "accepted" across it, also stating where it would be paid.

109. Could Mr. Horn make use of it before the 60 days expired?

Yes; he could pay it away by endorsing it; and the second holder could pay it away again by endorsing it under Mr. Horn's endorsement.

110. If, when abroad, you were offered a bill as above, and endorsed, what would you do before taking it?

Note the names and find out whether they were good names or not.

111. What is a bill of exchange?

It is almost similar to a home bill; but on account of the risk incurred in sending it home, it is drawn in sets of three, and usually made payable so many days after sight.

The following is the form of one:

Exchange of £100. *Odessa, September 9th, 19—*
No. 106.

Sixty days after sight of this FIRST OF EXCHANGE *(second and third of same tenour and date unpaid), pay to the order of John Thompson & Co., the sum of one hundred pounds sterling, value received.*

GEORGE WINTER.

To Messrs. Jones Brothers, Merchants, London.

112. If you took a bill of exchange for your freight, how would you transmit it to your owners?

Send No. 1 by post to my owners, and No. 2 by another mail, and retain No. 3 till I heard if the other had arrived or not.

113. Suppose the crew complain of the provisions, when in port, what should be done?

A survey should be called on the provisions, and the award entered in the Official Log Book.

114. If the crew refuse to go to sea through the alleged unseaworthiness of ship, what should be done?

A survey must be called.

115. Who pays?

The ship, if she is found to be unseaworthy; but the man or men who complained, if she is not. The money can be deducted from the wages when paid off.

116. If scurvy should make its appearance amongst the crew when at sea, what would you do?

Increase the allowance of lime juice to one ounce (two tablespoons-full) per day; give them preserved potatoes or onions, and greens, carrots, turnips, &c., if I had them; a plentiful supply of good water; attention to personal cleanliness, and to cleanliness, dryness and ventilation of the quarters of the crew, and give them gentle exercise. If in port, get fresh vegetables, watercresses especially, or fruit.

Average.

117. What are the two kinds of average?

Particular average and general average.

118. What is meant by particular average?

Where the loss falls on the ship, the cargo, or the freight, and which cannot be held as a loss for the benefit of all concerned. (Any damage or loss insured against.)

119. And by general average?

Where the loss falls on the value of the ship, freight, and cargo, (all parties concerned.)

120. Can you describe what is necessary to bring the loss under general average?

It must be a *voluntary sacrifice*, that is, the master, after consulting with the mates and crew, deliberately orders the cargo to be thrown overboard, the masts to be cut away, or anything else necessary to save the ship, secondly, there must be an *absolute necessity* for this loss; that is, the ship must be so situated, that without this sacrifice the ship and cargo would be lost.

121. A ship at anchor sees that she must be run into by another vessel if she does not slip; she therefore slips. Would the loss of chain and anchor come under general average?

Yes: because it was a voluntary sacrifice necessary to save the whole ship and cargo, and it did save them.

122. A vessel at anchor is fouled by another vessel, and loss sustained, would this come under general average?

No: it would be particular average.

123. A ship at sea is caught in a squall, whereby her masts are lost, is this a case of general average?

No: it would be particular average.

124. If she had been thrown on her beam ends, and the masts had been cut away by the master's orders?

Yes: that would bring it under general average.

125. Suppose you have incurred losses during the voyage which are proper subjects for a general average, what would you do on your arrival at your port or destination?

Make a regular protest, inserting the whole particulars of the jettison entered in the log book as soon after it as possible; and along with two or more of the crew, I would make oath that the goods were thrown overboard, or the loss incurred for the safety of the ship and the rest of the cargo, and for the preservation of the lives on board, and for no other cause.

126. Have you any lien on the cargo for the shipper's share of the loss?

Yes.

127. If you had been so placed during the voyage that you were forced to do something that will have to be settled by a general average, what would you get from the consignee before you delivered the cargo to him?

An average bond; a document by which he binds himself to pay his share of the general average.

Note.—The following questions will usually be asked by the Examiner.

MASTERS' BUSINESS.

Charter Party—An agreement between the owner and merchant for the hire of a ship for one or more voyages.

Bill of Lading—Master's receipt for the goods shipped on board.

Contents of Bill of Lading—A full account of cargo on board, by whom shipped, who consigned to, and clauses same as Charter Party.

Manifest—A document dated and signed by the master, containing full particulars relating to the ship, cargo, crew, and passengers (if any.)

Putting into port with damage through stress of weather—Report myself to the port authorities, note a protest, call a survey and get a report from the surveyors, containing the nature and extent of the damage. Then extend the protest and call the surveyors again to survey the ship when all the damage is repaired, and get a certificate from them stating that the ship is fit to proceed to sea, and the repairs have been executed.

Bottomry Bond—A contract whereby a ship is pledged in security of money advanced for the purposes of her voyage.

Respondentia—A contract whereby the cargo is pledged in security of money advanced for the purposes of her voyage.

General Average—A voluntary sacrifice, whereby a part is sacrificed to save the remainder.

Particular Average—Accident unavoidably happening through some peril insured against.

Bill of Exchange—A request from one party to another, directing the latter to pay to some third party a certain sum of money at a certain date.

Grain Certificate—A certificate filled in by the master containing a full account of all the grain in the ship, how stowed, where stowed, precautions taken for the prevention of its shifting, and the ship's draught of water and free board.

Average Bond—A document signed by the consignee, agreeing to pay his share of any General Average that may justly arise.

Salvage Agreement—An agreement between the master and a contractor for the salving of a vessel and cargo.

What Documents to take to Shipping Office—Ship's Register, Load Line Certificate, Officers' and Engineers' Certificates, Apprentices Indentures (if any).

Documents from Shipping Office—Articles, E.N.G. or Return List, Account of Wages Book, Official Log, A.A., and Crew List for Owners.

Clearing out Customs, what to take—Ship's Register, last Light Bill, A.A., B.B., Content, Manifest, Victualling Bill, Cocket Card, and Jerking Note.

What Documents to get from Customs after clearing out—Port Clearance, Dock Pass, Light Bill, Bill of Health. The Bill of Health must be taken to the Consul of the country bound to, to be endorsed.

Entering in, what to take to the Custom House—Ship's Register, last Light Bill, Report List, Manifest, Bill of Lading, Searching Note, Quarantine Certificate, and Ship's Letter Declaration. (Two report lists are required for loaded ships and one for light.)

SHIPPING OFFICE & CUSTOMS DOCUMENTS.

Ship's Register—A document showing the ownership of a vessel and giving a general description of her. The Master's name is always on the back of the register.

E.N.G. or Return List—The list of crew sent back to the Shipping Office stating the names of any that have failed to join and substitutes engaged ("pier head jumps.")

Articles—Agreement between the Master and Crew.

A.A.—Proof that the necessary certificated officers have been "signed on," and the crew engaged.

B.B.—Proof of the last crew receiving their wages and that the Official Log, Agreement, and Crew List have been delivered to the Shipping Master.

Last Light Bill—To show when the Light Dues were last paid.

Cocket Card—A clearance card signed by the Searcher and Collector of Customs.

Content—A description of goods shipped, stores, number of crew and passengers (if any).

Manifest—A full description of all goods shipped, with their marks and numbers.

Victualling Bill—A list of bonded stores intended for the voyage.

Jerking Note—A note to signify the vessel has been searched for unentered goods after discharging. It contains a list of bonded stores left on board.

Report List—A description of goods, stores, number of crew and passengers (if any).

Searching Note—A note certifying the ship has been searched on arrival.

Quarantine Certificate—A certificate admitting the ship to pratique, or permission for the master and crew to land.

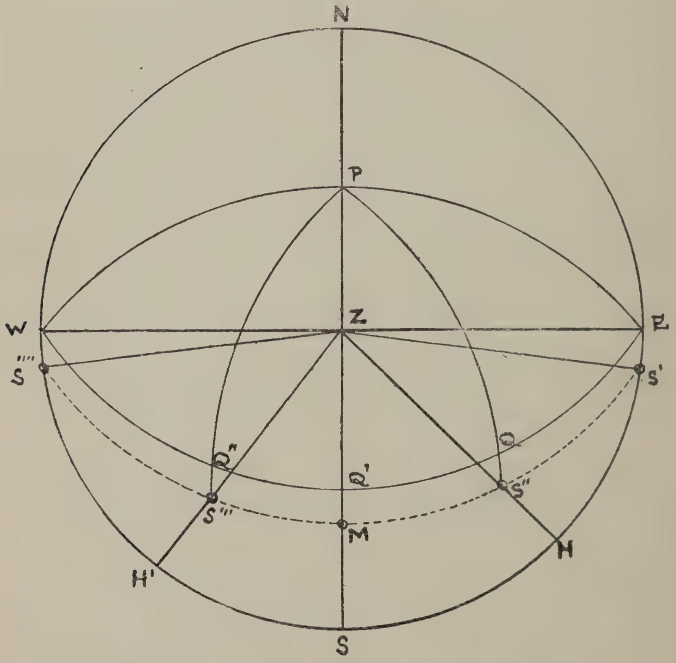
Ship's Letter Declaration—A document signed by the Master certifying that he has brought no letters.

PART II.

DEFINITIONS.

It is essential that this diagram should be thoroughly understood; the definitions to follow will assist the candidate to do so.

Fig. 80.



N E S W represents the rational horizon.

P the pole. N and S—North & South points of the horizon.

Z „ zenith. E do. W—East & West do. do.

P N = the altitude of the pole which is equal to Z Q′ the latitude of the place.

S′, S″, S‴, S⁗ is the parallel of the object's declination and represents the object in four different positions from rising to setting.

Z S′, Z S″, Z S‴ and Z S⁗ = Zenith Distance.
S″ H and S‴ H = True Altitude.
P S″ and P S‴ = Polar Distance.
Q S″ and Q″ S‴ = Declination.
Z P S″ = nearly three hours of easterly hour angle.
Z P S‴ = about two and half hours of westerly hour angle.
P Z S″ or S Z S″ = True Azimuth.
P Z S‴ or S Z S‴ = True Azimuth.
E Z S′ or E S′ = True amplitude at rising.
W Z S⁗ or W S⁗ = True amplitude at setting.
N S = Observer's Meridian.
W E = Prime Vertical.
W P E = Six hours circle.
P Z = Co-latitude.
M is the object on the meridian.
M S = Meridian Altitude.
Z M = Meridian Zenith Distance.
Q′ M = Declination.
P M = Polar Distance.

The latitude of this diagram represents about 48° N; the circles drawn to the pole or passing through it are meridians; the circles (which are drawn as straight lines) meeting the zenith or passing through it are vertical circles.

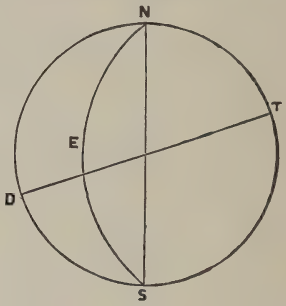
N S is both a meridian and a vertical circle.

DEFINITIONS. (1st Examination.)

The Candidate is expected to write a short definition or answer accompanied by a rough sketch or diagram in the case of so many of the following questions as may be marked with a cross by the Examiner. The Examiner will mark not less than ten. The writing should be clear, and the spelling must not be disregarded.

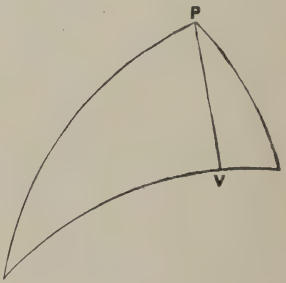
1. *Great Circles*—Circles whose planes pass through the centre of any sphere. N E S, N S and D T are great circles.

   Note.—A great circle divides a sphere into two equal parts.



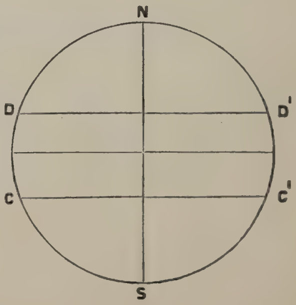
2. *Vertex of a Great Circle*—That point of the great circle furthest from the equator. V is the Vertex, P the Pole.

   Note.—All great circles round the earth (except the equator) have two vertices, one in the Northern and one in the Southern hemisphere.



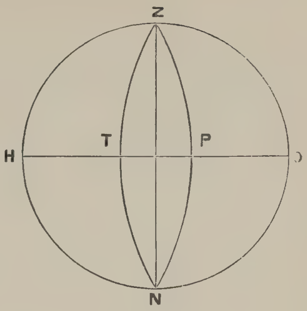
3. *Small Circles*—Circles whose planes do not pass through the centre of any sphere. D D′ and C C′ are small Circles.

   Note.—A small circle divides a sphere into two unequal parts.



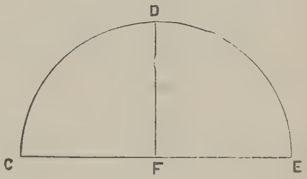
4. *Vertical Circles*—Great circles passing through the zenith and nadir, cutting the horizon at right angles. Z P N and Z T N are vertical circles.

Note.—All vertical circles are perpendicular to the horizon, H O is the horizon, Z the zenith, and N the nadir.



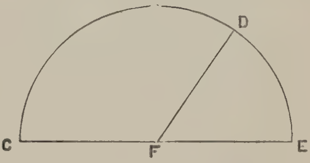
5. *Right Angle*—The inclination of two lines, one perpendicular to the other, meeting at a point = 90°, D F C and D F E are right angles.

Note.—An arc forms the measurement of any angle.



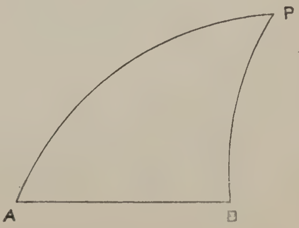
6. *Oblique Angle* — Any angle which is not a right angle. D F C and DFE are Oblique Angles.

7. *Obtuse Angle*—Any Angle greater than a right angle or 90°, as the angle D F C.

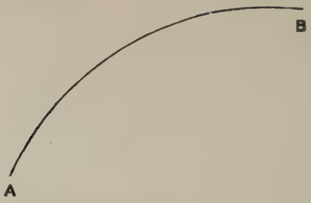


8. *Spherical angle* — The angle on the surface of any sphere, contained between two great circles at their point of intersection, A P B is a Spherical Angle.

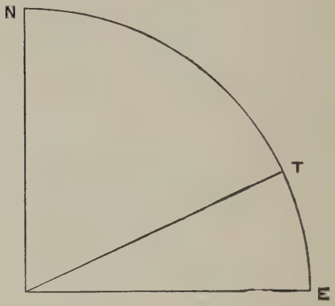
Note.—A P and B P are two Great Circles.



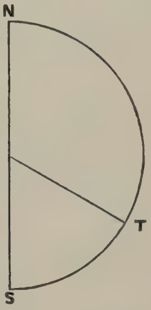
9. *Arc*—Part of the circumference of a circle. A B is an arc.



10. *Complement of an Arc or Angle*—The angle subtracted from 90°. E T is the complement of N T.

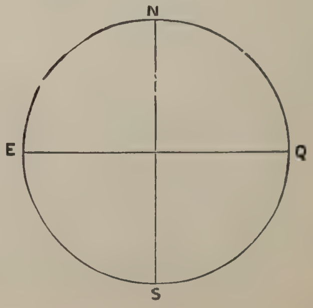


11. *Supplement of an Arc or Angle*—The angle subtracted from 180°. S T is the supplement of N T.



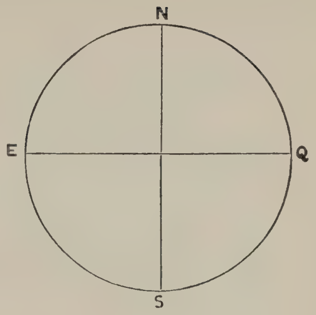
12. *The Equator*—A great circle round the earth midway between the two poles. E Q is the Equator.

Note.—Any point on the Equator is 90° from either pole. N and S are the North and South Poles.



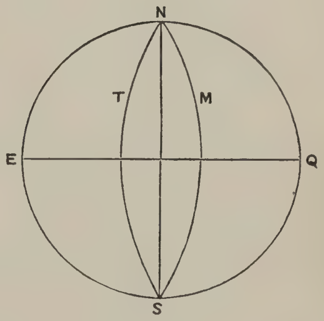
13. *The Poles*—Ends of the axis of the earth. N is the North Pole and S the South.

Note.—The axis is the diameter round which the earth revolves.



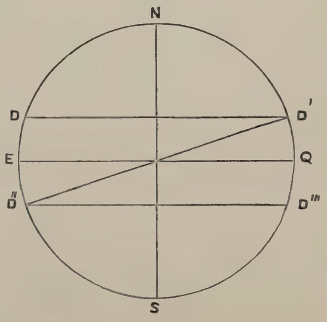
14. *A Meridian*—A great circle passing through both Poles. NTS and N M S are Meridians.

Note. — All Meridians cut the Equator at right angles.



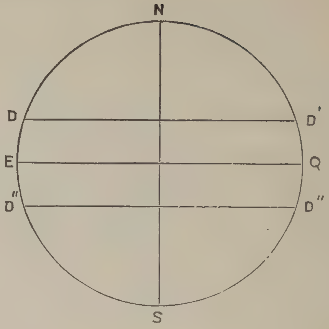
15. *The Ecliptic*—A great circle that the sun appears to describe in a year; it is the earth's real path. D'' D' is the Ecliptic.

Note.–The sun crosses the Equator 21st March, is on the tropic of Cancer 21st June, crosses the Equator again 23rd Sept., and reaches the tropic of Capricorn 21st December.



16. *The Tropics* —— Two small circles parallel to the equator. Tropic of Cancer 23° 28′ N and Tropic of Capricorn 23° 28′ S. D D′ is the Tropic of Cancer, and D″D‴ is the Tropic of Capricorn.

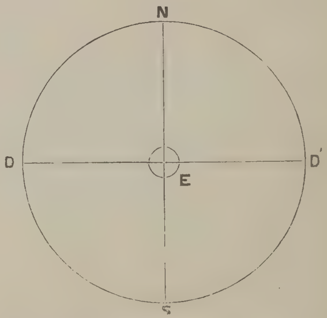
Note.—The sun's annual path in the heavens is bounded by these two circles.



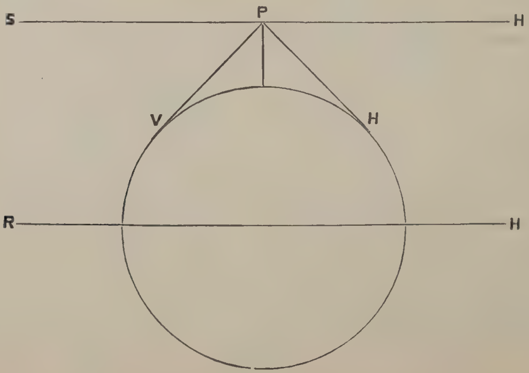
17. *Equinoctial*—Celestial equator; it is the Earth's equator extended to the Celestial Concave. E is the Earth, D D′ is the equinoctial.

Note.—The Celestial Concave is an imaginary sphere round the Earth, the radius of which is infinite.

D N D′ S is the Celestial Concave.

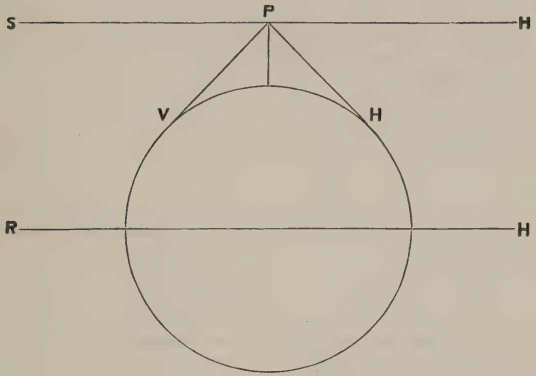


18. *The Visible Horizon*—The circle that bounds the view at sea. P is the observer's position, V H is the Visible Horizon.



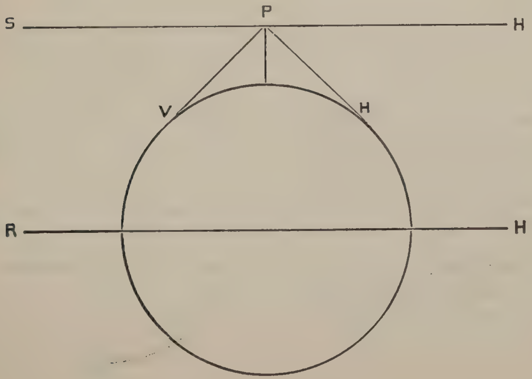
19. *The Sensible Horizon*—A horizontal plane passing through the place of the observer. SH is the Sensible Horizon.

Note.—The Sensible Horizon is extended from the Earth's surface perpendicular to a plumb line.



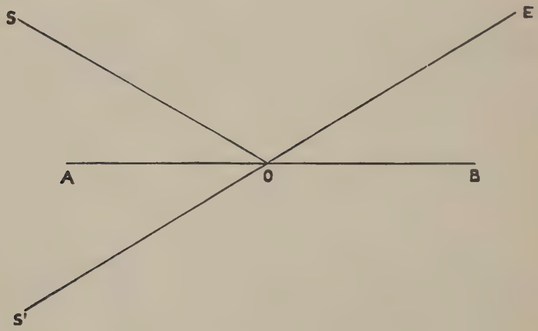
20. *The Rational Horizon*—A great circle whose plane passes through the centre of the Earth parallel to the sensible horizon. R H is the Rational Horizon.

Note.—A plane is a flat surface.



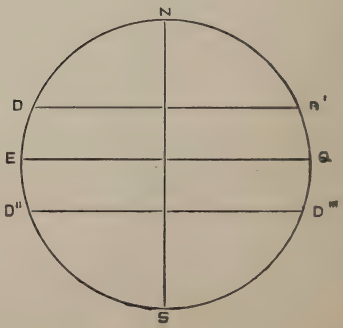
21. *Artificial Horizon and its use*—Any reflector whose surface is perfectly level. It is used for taking altitudes on shore. S is the sun, SOS′ is twice the altitude, E the eye, and A B the Artificial Horizon.

Note.—The object is reflected at the same angle below the plane of the Artificial Horizon, as it is above. S′ is the reflected object. a tray of quicksilver is generally used.



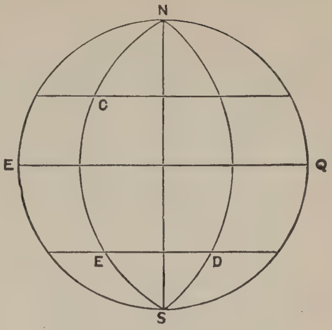
22. *Parallels of Latitude*—Small circles parallel to the equator· D D′ and D″ D‴ are parallels of latitude.

Note.—Every place on the same parallel has the same latitude.



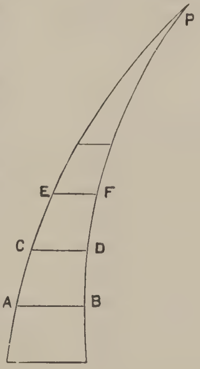
23. *Difference of Latitude*—An arc of a meridian intercepted between the parallels of any two places. CE is the difference of latitude between C and D.

Note.—Difference of latitude is the distance a ship sails true North or South.

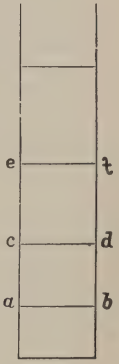


24. *Meridional Parts*—The length of the enlarged meridians on a Mercator's Chart in miles of the equator for every minute of latitude. Fig. 2 represents the expanded meridians and parallels of latitude of Fig. 1.

Note—The length of a degree of latitude increases as it recedes from the equator (Mercator's chart.)



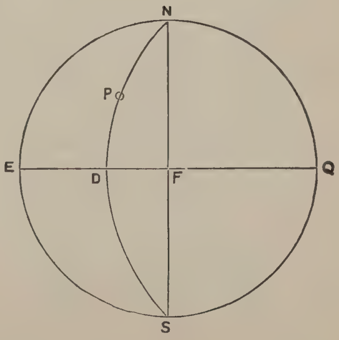
(1)



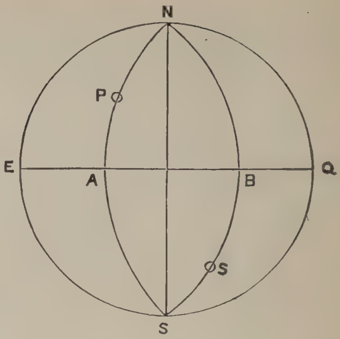
(2)

25. *Longitude*—An arc of the equator between the first meridian and the meridian passing through the place. D F or D N F is the longitude of P. N F S is the meridian of Greenwich.

Note.—Longitude is the angular distance of any place East or West of the meridian of Greenwich.

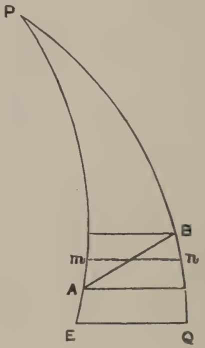


26. *Difference of Longitude*—An arc of the equator between the meridians of any two places. A B is the difference or longitude between P and S.



27. *Departure*—Is the distance in nautical miles a ship sails true East or West. m n is the departure between A and B.

Note.—The parallel of the middle latitude between the places is equal to the departure.

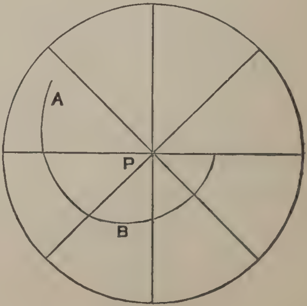


28. *Nautical Mile*—The mean length of a minute of latitude, it is equal to 6080 feet.

Note.—The true length of a nautical mile is different for every latitude.

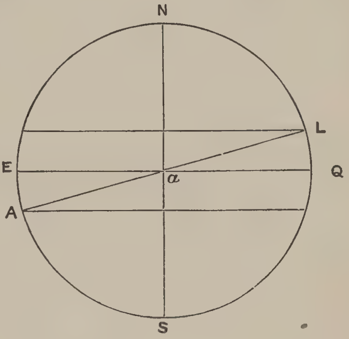
29. *Rhumb Line*—The line which joins two places, cutting all the meridians at the same angle. A B is a rhumb line.

Note.—If the rhumb line was extended, it would be always nearing the pole, but would never reach it.



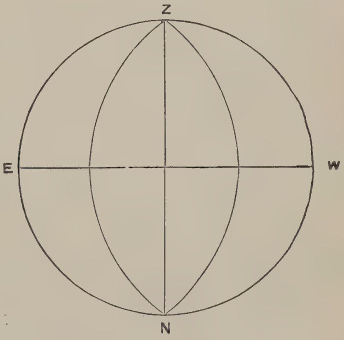
30. *Prime Meridian*—That fixed meridian from which longitude is measured.

Note,—The meridian of Greenwich has been adopted by most countries as the first meridian. N F S (Fig. 25) is the meridian of Greenwich.

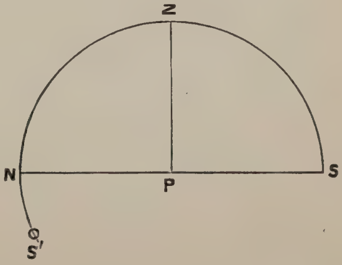


31. *First Point of Aries*—The point where the sun cuts the equinoctial passing from South to North. *a* is the first point of Aries.

Note.—The point where the sun cuts the equinoctial passing from North to South is called the first point of Libra. A L is the ecliptic.



32. *Prime Vertical*—That vertical circle cutting the East and West points of the horizon. Z E N W is the prime vertical. E W is the horizon.

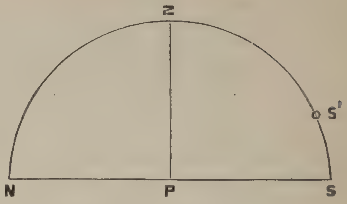


33. *Civil Time*—The day begins at midnight and ends the following midnight. S′ is the sun on the lower meridian.

Note.— From midnight to noon is called A.M., and from noon to midnight is called P.M., the day begins when the sun is on the lower meridian. N is the North point of the horizon, S the South. P is the observer.

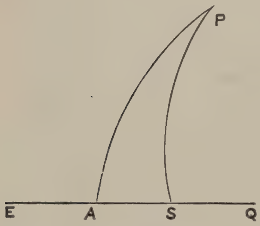
34. *Astronomical Time*—The day beginning at noon and ending the following noon, reckoned through 24 hours. S′ is the sun on the upper meridian.

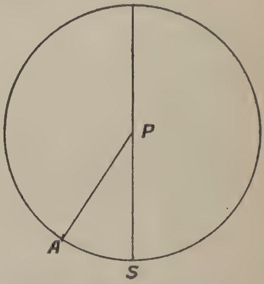
Note.—There is no A.M. or P.M. in astronomical time, the day begins when the sun is on the upper meridian.



35. *Sidereal Time*—The Westerly hour angle of the first point of Aries. A P S is the sidereal time.

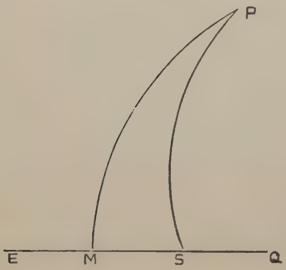
Note.—The time since the first point of Aries passed the observer's meridian. P A is the meridian of the first point of Aries, P S is the meridian of the ship, E Q is the equinoctial.

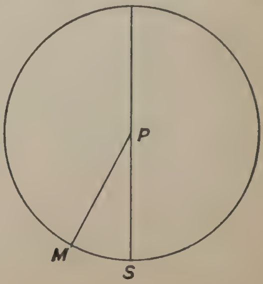




36. *Mean Time*—Westerly hour angle of the mean sun. M P S is the mean time.

Note.—P M is the meridian of the mean sun, P S the meridian of the ship or place. The mean sun is an

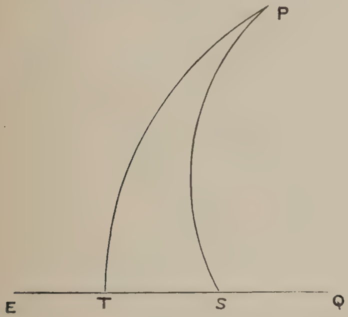


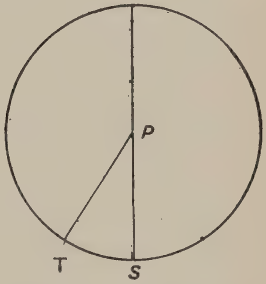


imaginary sun moving on the equator, and keeping uniform time, which the true sun does not.

37. *Apparent Time*—Westerly hour angle of the true sun. T P S is the apparent time.

Note.—The time since the true sun passed the observer's meridian. P T is the true sun's meridian and P S is the observer's meridian.

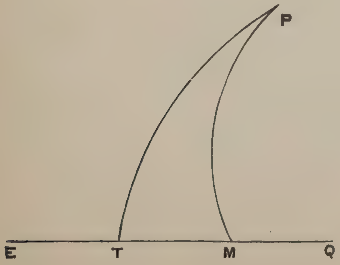


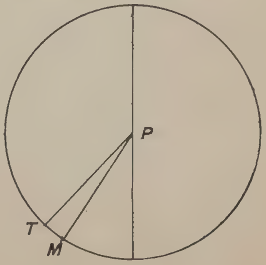


Plane of the Equator.

38. *Equation of Time; why it is used, and when it is at a maximum, and when at a minimum*—Is the angle at the pole between the meridian of the true sun and that of the mean sun; it is used to convert mean time into apparent, or apparent into mean; it is at a maximum when the angle between the meridians is greatest, and at a minimum when the meridians coincide. T P M is the equation of time.

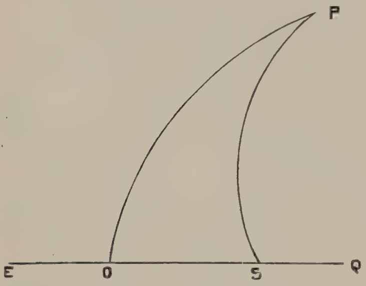
Note.—Four times in the year it is at a maximum, about 11th February, 14th May, 26th July, and 3rd November; it also vanishes four times in the year about 15th April, 15th June, 31st August and 24th December.

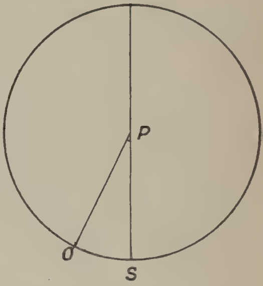




39. *Hour angle of a Celestial object*—The angle at the pole between the observer's meridian and the meridian passing through the centre of the object. O P S is the hour angle.

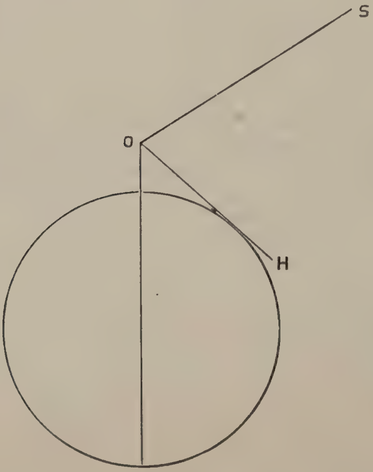
Note.—P O is the object's meridian, P S is the observer's meridian. An arc of the equator measures an angle at the pole, O S = O P S.





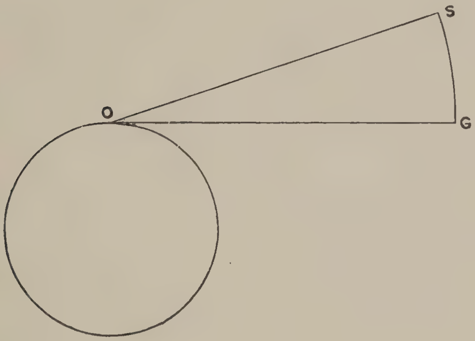
40. *Observed Altitude*—The angular height of an object measured with a sextant. S O H is the observed altitude.

Note.—The observed altitude will have to be corrected for index error (if any). S is the object, O the observer, and H the visible horizon.



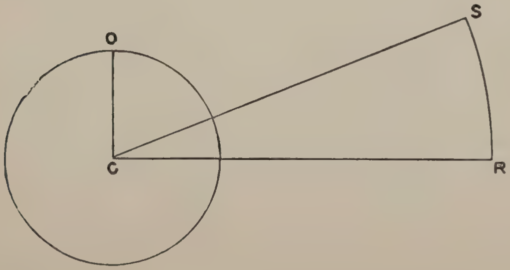
41. *Apparent Altitude*—The angular height of an object's centre above the sensible horizon. SOG is the apparent altitude.

Note.—The observed altitude corrected for I.E., dip and semi-diameter gives the apparent altitude. S is the object, O the observer, and O G the sensible horizon.



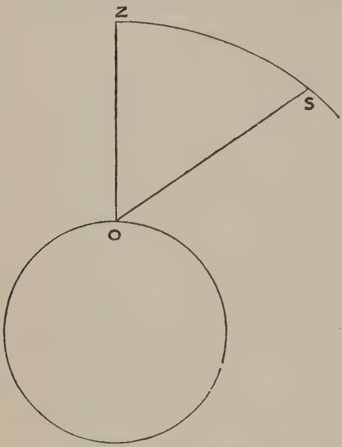
42. *True Altitude*—The angular height of an object's centre above the rational horizon. S C R is the true altitude.

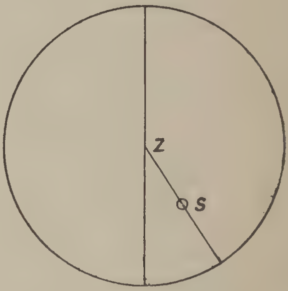
Note.—The apparent altitude corrected for refraction and parallax gives the true altitude. C R is the rational horizon. All altitudes are measured on vertical circles.



43. *Zenith Distance*—An arc of a vertical circle between the object and the zenith, Z O S or Z S is the zenith distance.

Note.—Zenith distance is the angular distance of an object from the zenith. Z is the zenith, O the observer, and S the object.

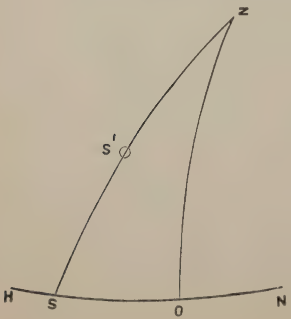


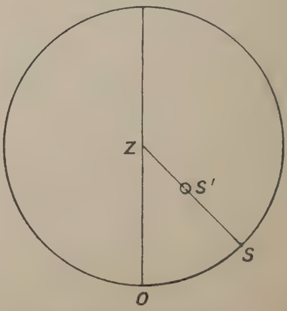


Plane of the Horizon.

44. *Azimuth*—An arc of the horizon between the observer's meridian and a vertical circle passing through the centre of the object. S O or S Z O is the azimuth, S′ the object.

Note.—An azimuth is the bearing of an object from the N or S points of the horizon. Z S is the vertical circle passing through the object, Z O the observer's meridian, and H N the horizon.

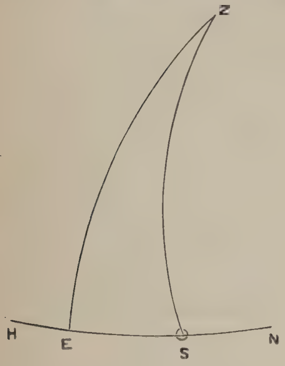


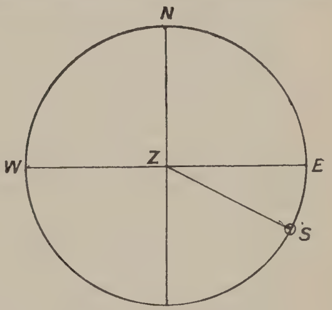


Plane of the Horizon.

45. *Amplitude*—An arc of the horizon between the prime vertical and the object, at rising or setting. E S is the Amplitude of S.

Note.—An amplitude is the bearing from the East point of the horizon at rising, and the West point at setting. E is the East point of the horizon, and Z E the prime vertical.

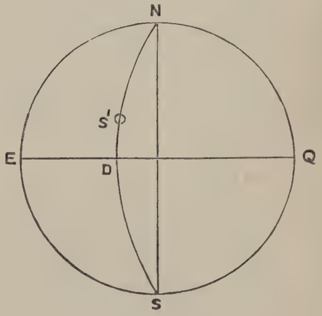




Plane of the Horizon.

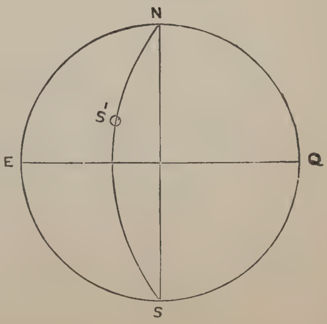
46. *Declination*—An arc of a meridian between the object and the equinoctial. S′ D is the declination.

Note.—The declination of a celestial body corresponds to latitude. EQ is the equinoctial.



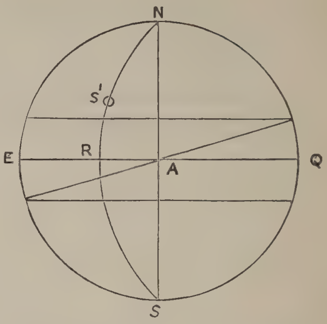
47. *Polar Distance*–An arc of a meridian between the object and the pole nearest the observer. S′ N or S′ S is the Polar Distance.

Note.–Declination is the distance North or South of the equinoctial. Polar distance is the distance from the pole. E Q is the Equinoctial.



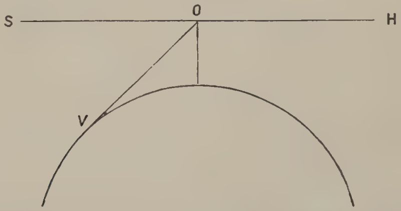
48. *Right Ascension*— An arc of the equinoctial measured to the Eastward, between the first point of Aries and the meridian passing through the centre of the object. A Q E R is the Right Ascension of S′.

Note.—Right Ascension corresponds to longitude, A is the first point of Aries.



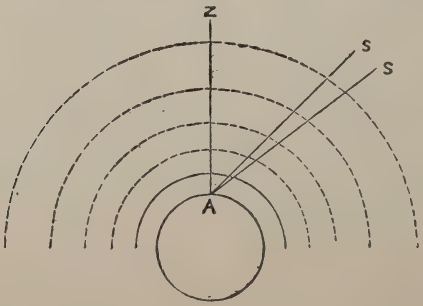
49. *Dip or Depression of the horizon*—The angle between the visible and sensible horizons. S O V is the Dip.

Note.—The higher the height of eye, the more the visible horizon will be depressed below the level of the sensible horizon. S H is the Sensible Horizon, V the Visible Horizon, and O the Observer.



50. *Refraction*—The bending of rays of light, due to passing through the atmosphere. S A S′ is the Refraction,

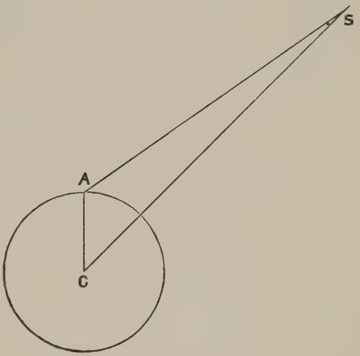
Note.—A ray of light from any object is bent towards the vertical as it passes through the increasing density of



the atmosphere, making the object appear higher in altitude than it really is. A is the Observer, Z the Zenith, S′ the apparent position of the object and S the true position.

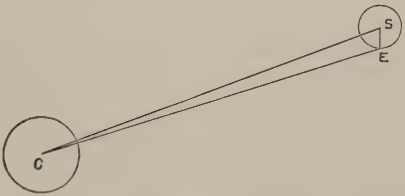
51. *Parallax*–The angle at the centre of a celestial object subtended by the radius of the earth. CSA is the Parallax.

Note.—Parallax is the error caused by looking from the surface instead of from the centre of the earth. A is the Observer, C the centre of the earth and S the object, A C is the Radius.



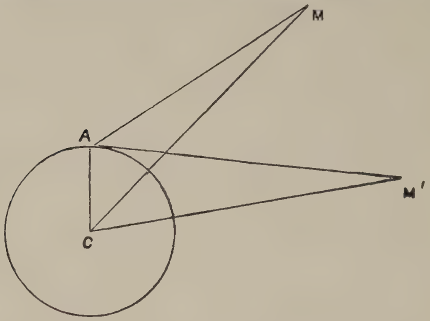
52. *Semi-diameter*—The angle at the centre of the earth subtended by the radius of a celestial body. S C E is the Semi-diameter.

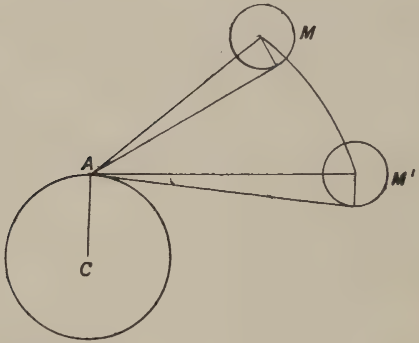
Note.—Semi-diameter is the angular measurement of half the diameter, C is the earth's centre, S the object's centre, and E object's lower limb.



53. *Augmentation of Moon's Semi-diameter*—A correction to be applied to the semi-diameter, because it increases with the altitude. The difference between the semi-diameter at M and M′ is the Augmentation.

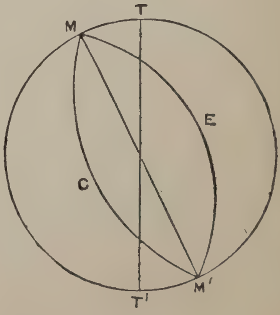
Note.—A is the Observer, C the Earth's Centre, M′ the Moon on the Horizon, and M the Moon in Altitude. A M′ and C M′ are practically equal, but A M is less than C M, consequently the semi-diameter at M must be greater than at M′. In other objects the distance from the earth is too great to make any sensible difference.





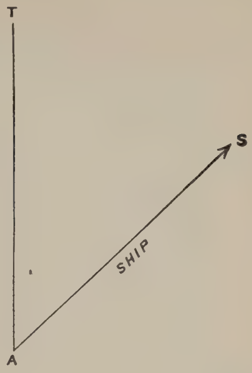
54. *Magnetic Meridian*—A great circle, in whose plane lies the compass needle when unaffected by deviation. M C M′ and M E M′ are Magnetic Meridians.

Note.—The North magnetic pole is in lat 70° N, long 97° W, and South magnetic in lat. 74° S, long 147° E, M and M′ are the Magnetic Poles, T and T′ are the True Poles.



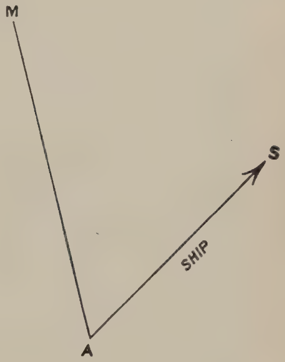
55. *True Course of a Ship*—The angle between the ship's track and a true meridian. T A S is the True Course.

Note.—T A is a True Meridian, A S is the Ship's Track.



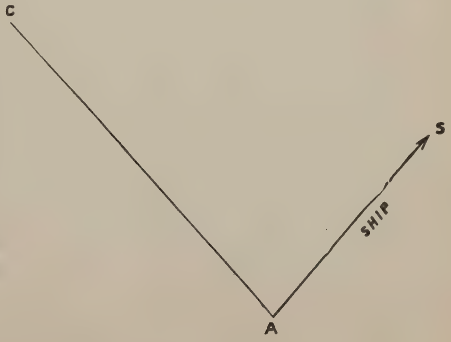
56. *Magnetic Course*—The angle between the ship's track and a magnetic meridian. M A S is the Magnetic Course.

Note.—M A is the Magnetic Meridian.



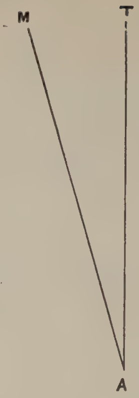
57. *Compass Course*—The angle between the ship's track and the compass needle. C A S is the compass course.

Note.—C A is the direction of the compass needle.



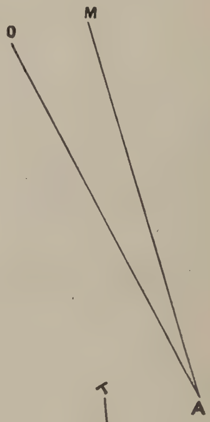
58. *Variation of the Compass.*—The angle between the true and magnetic meridians. M A T is the variation.

Note.—What the needle is deflected to the right or left of the true meridian through the magnetism of the earth. M A is the mag. meridian, T A is the true meridian.



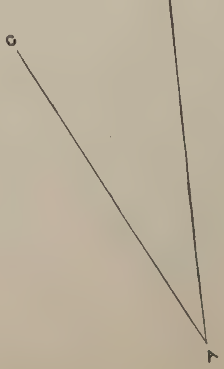
59. *Deviation of the Compass and how it is caused*—The angle between the compass needle and the magnetic meridian, caused by the deflection of the needle to the right or left of the magnetic meridianthrough the magnetism of the ship. O A M is the deviation.

Note.—O A is the compass needle, M A the magnetic meridian.



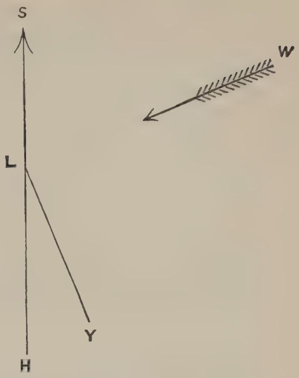
60. *The error of the Compass*—The angle between the compass needle and the true meridian. T A C is the error.

Note.—Error of the compass is the combined effect of variation and deviation. C A is the compass needle, T A the true meridian.



61. *Leeway*—The angle between the ship's wake and the line of her keel. H L Y is the leeway.

Note.—S L is the ship, W the wind, L Y the ship's wake.



62. Does the variation change with time?

Yes; there is an annual change of 7′.

63. Is the variation the same all over the world?

No.

64. Where do you find the variation?

From a variation chart.

65. Does the deviation change, if so, when?

Yes; it changes rapidly in a new ship, by change of latitude, heeling over, collision, stranding, very heavy seas, cargo of iron, and by an alteration of the course steered for a long time. The deviation alters on every point of the ship's head.

66. Where is the North magnetic pole situated?

In Lat. 70° N, Long. 97° W.

67. Where is the South magnetic pole situated?

In Lat. 74° S, Long. 147° E.

68. Should the compass needle point to the magnetic or the true pole of the earth?

Magnetic.

69. When is the altitude of an object most seriously affected by refraction?

When the altitude is low.

70. Where is the Pole star situated?

$1\frac{1}{4}°$ from the North celestial pole.

71. Which is the most favourable time for determining the hour angle of a celestial body, and thence the longitude, and state the reason why ?

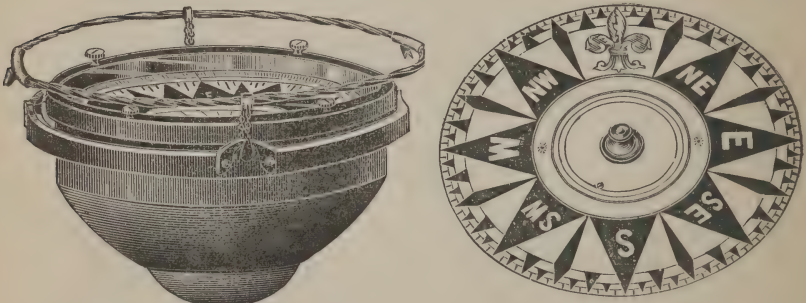
When the object is on the prime vertical, because the altitude rises or falls fastest, and an error in altitude or latitude will have the least effect on the hour angle.

Note.—It is only possible to have an object on the prime vertical when the latitude and declination are same names.

72. Describe the construction of a mariner's compass.

A mariner's compass consists of a copper bowl hung by

Fig. 81.

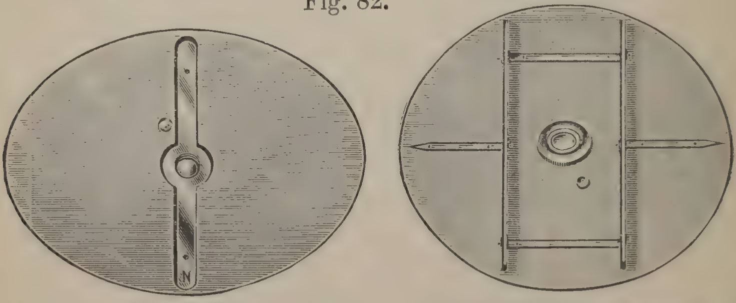


Compass suspended from wire grummet.

Upper side of Card.

These Diagrams are only for explanation and not to be drawn.

Fig. 82.



Under side of Card showing one needle.

Under side of Card showing two needles.

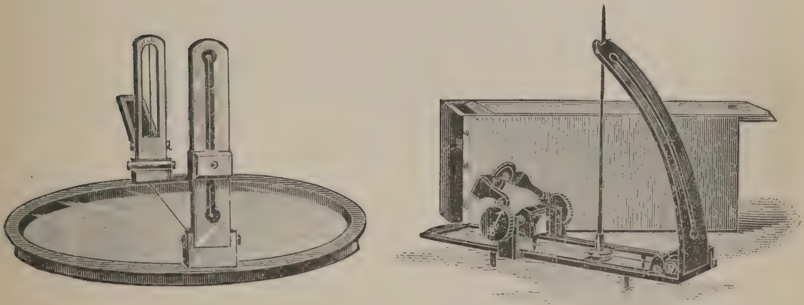
gimbals, so as to retain a horizontal position. The bowl contains a pivot on which is poised a compass card fitted with one or more magnetised needles, the card is divided into points, half-points, quarter-points, and degrees, it turns freely round its centre, and shews the direction of the ship's head by the lubber point on the fore side of the bowl.

73. Describe an azimuth compass.

An azimuth compass is an ordinary compass fitted with sight vanes having vertical slits, through which is seen the bearing of the object on the edge of the compass card.

Note.—The sight vanes are two oblong pieces of brass, fitted on the edge of the compass (one always opposite the other) which can be turned in any direction.

Fig. 83.



Azimuth Folding Sights with Reflector.

Cross Bar Azimuth with Prism.

74. Describe a Pelorus, and its use.

A Pelorus is a circular plate, with a compass graduated upon it and fitted with a sight vane; it is free to revolve upon a central pivot, and has a lubber line, on the outside rim. The sight vane clamped at the known magnetic bearing of any object and turned direct towards it, the direction of the ship's head magnetic will be shown at the lubber point. A Pelorus is useful in correcting a compass, or in determining the deviation. (See Fig. 84.)

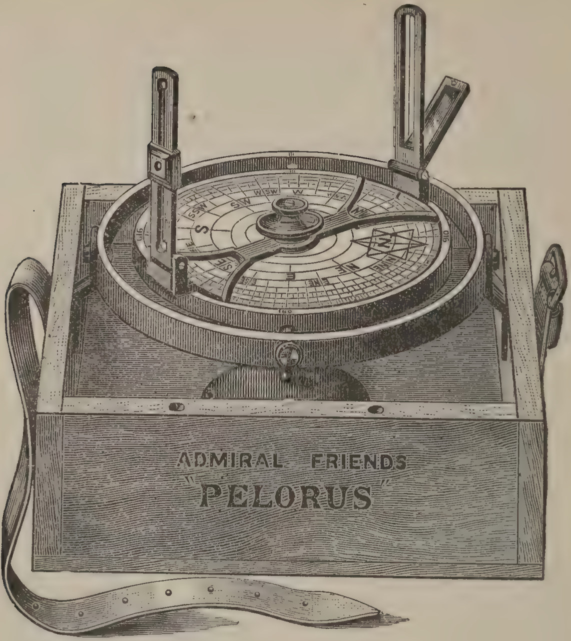


Fig. 84.

75. Describe a Chronometer, and its use.

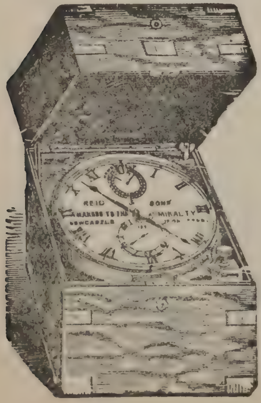


Fig. 85.

A chronometer is merely the best possible watch or clock that can be made, so constructed that it is compensated for temperature with a balance which will have the least possible effect on the rate. It is used for ascertaining the correct mean time at Greenwich.

MEANING OF WORDS USED IN THE DEFINITIONS,

Which will be asked by the Examiner.

Great Circles—Circles whose planes pass through the centre of any sphere.

Small Circles or Lesser Circles—Circles whose planes do not pass through the centre of any sphere.

Sphere—Globe or ball.

Axis—Is the diameter around which the earth revolves.

Apparent—As it appears from the position of the observer.

Parallel—Two lines which never meet, no matter how far extended.

Vertical—Perpendicular to the sensible horizon (straight up and down).

Horizontal—Perpendicular to vertical (level).

Perpendicular—At right angles.

Right Angle—An angle measuring 90°.

Plumb Line—Hangs vertically.

Angle—Inclination of two lines meeting at a point.

What forms the measurement of an Angle—The arc which subtends the angle.

Subtended—Opposite.

True Meridian—Meridian passing through the true poles.

Magnetic Meridian—Meridian passing through the magnetic poles.

Altitude—Height.

First point of Aries—Where the sun cuts the equinoctial passing from South to North.

Equinoctial—Celestial Equator.

Arc—Part of a circle.

Angular measurement or Angular distance—The arc which measures the angle.

Zenith—Point in space overhead.

Nadir—Point in space beneath the observer's feet.

Radius—Half the diameter.

Plane—Flat surface.

Elevated Pole—Pole nearest the observer.

What measures an angle at the pole—An arc of the equator.

What measures an angle at the zenith—An arc of the horizon.

Centre of a circle—A point equi-distant from any part of the circumference (middle).

Circle—A line, any part of which is equi-distant from a point, that point being its centre.

For Barometer, Thermometer and Hydrometer see "Reed's New Guide Book" or "Reed's Memory Work."

ADJUSTMENTS OF THE SEXTANT.

(FOR ALL CANDIDATES.)

Vivâ Voce.

1. What is the first adjustment of the Sextant?

To set the index glass perpendicular to the plane of the instrument.

2. How do you make that adjustment?

Place the vernier near the middle of the arc, and look into the index glass to see the arc and its reflection appear in one continuous line; if they do not, slacken or tighten the outer screws in the frame upon which the glass stands, until they do.

3. What is the second adjustment?

To set the horizon glass perpendicular to the plane of the instrument.

4. Describe how you make that adjustment?

Clamp the index at 0, hold the instrument obliquely (face up), and look at the horizon to see the true and reflected horizon appear in one line; if they do not, move the upper screw at the back of the glass until they do.

5. What is the third adjustment?

To set the index and horizon glasses parallel to each other when the index is at 0.

6. How would you make the third adjustment?

Clamp the index at 0, hold the instrument vertically, and look at the horizon to see the true and reflected parts form one line; if they do not, move the lower screw at the back of the glass until they do.

7. In the absence of a screw how would you proceed?

Find the index error.

8. How would you find the index error by the horizon?

Clamp the index at 0, hold the instrument vertically, and look at the horizon to see the true and reflected parts form one line; if they do not, move the tangent screw until they do, the reading is the index error.

9. How is it to be applied?

Subtract when on and add when off the arc.

10. Place the index at error of   minutes to be added, clamp it, and leave it.

(NOTE.—The Examiner will see that it is correct.)

11. The Examiner will then place the zero of the vernier on the arc, not near any of the marked divisions, and the Candidate will read it.

Note.—In all cases the Applicants will name or otherwise point out the screws used in the various adjustments.

12. How do you find the index error by the Sun.

Clamp the index about 32′ on the arc, and look at the sun, two suns will appear, bring their upper and lower limbs in exact contact, and note the reading, then clamp at about 32′ off the arc making an exact contact as before, note the reading, half the difference of the two readings will be the index error, to be added when the greater reading is off the arc and subtracted when on.

13. The readings being { } What is the index error, and how do you apply it?

32′ 50″ off
34 30 on

2) 1 40

0 50 to subtract

14. What proof have you that those measurements or angles have been taken with tolerable accuracy?

The sum of the two readings divided by 4 should be equal to the sun's sem-diameter that day.

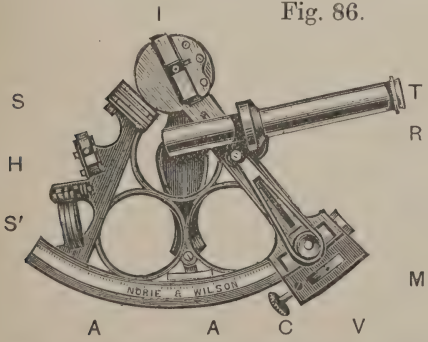


Fig. 86.

A = Arc.
H = Horizon Glass.
R = Telescope Ring.
M = Microscope.
S = Index Shades.
C = Tangent Screw.
I = Index Glass.
T = Telescope.
V = Vernier.
S′ = Horizon Shades.

The other parts are the Plane (flat part), Tangent Screw (under Vernier), 1st Adjustment Screws, 2nd Adjustment Screw and 3rd Adjustment Screw. The adjustment screws are visible in the figure.

THE COMMERCIAL CODE OF SIGNALS.

In reading any signal there can be no difficulty in finding it in the Signal book, as the flags are all arranged in *alphabetical* order, from the beginning to the end of the book—*One* flag signals *first*, *two* flag signals *next*, *three* flag signals *third*, *four* flag signals *last*.

Men of War and Merchant Ship's names are found in the "British Code List," which is a separate book from the "International Code of Signals."

*MAKING SIGNALS, (Part I.)

Spelling words page 6, or from spelling table	page 516
Numeral signals page 7, or from Numeral table	,, 421
Signals for vessels towing or being towed	,, 8
Urgent and Important Signals ...	,, 9
Urgent and Important Signals, (*two flags*)	pages 10 to 19

Three Flags:—

Compass signals in degrees and points,	pages 20 and 21
Money	,, 22 to 25
Measures & weights of different Countries	,, 26 to 31
Decimals and Fractions ...	,, 32
Metrical weights, &c., and their British equivalents	,, 32 and 33
Auxiliary Phrases, such as: Am I not; They are not; Could or might not be; I should have been; If you do, &c.	,, 34 to 63

Note.—Urgent signals, money, weights and measures, and auxiliary phrases can also be found in the general vocabulary the same as ordinary signals.

Three Flags:—

General vocabulary—where all ordinary signals are made and read ...	pages 64 to 414

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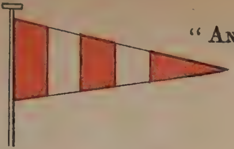
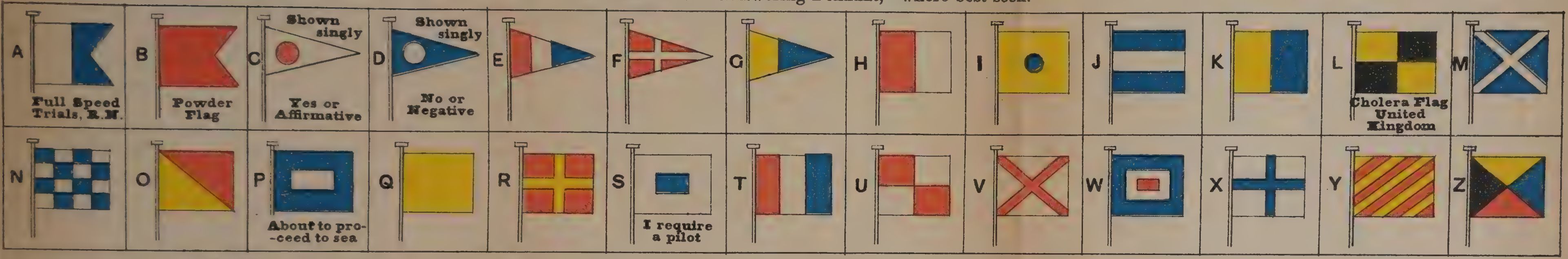
* All numbers of Pages and Diagrams under this heading refer to the Signal Book.

FLAGS OF THE COMMERCIAL CODE OF SIGNALS, FOR THE USE OF ALL NATIONS.



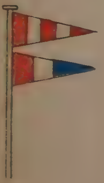
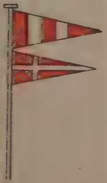
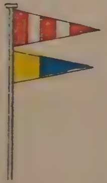
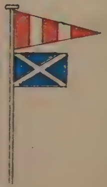
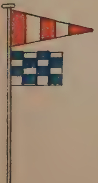
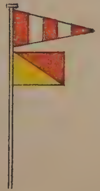
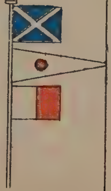
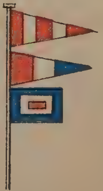
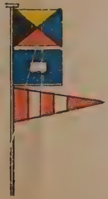
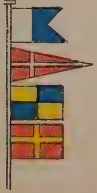
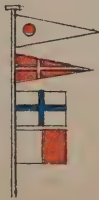
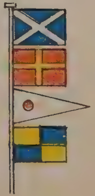
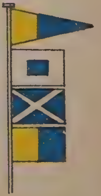
N.B.—When used as the "Code Signal," this Pennant is to be hoisted under the "Ensign;" when used as the "Answering Pennant," where best seen.



The following examples will serve to illustrate how the *form of a Hoist* will usually denote the *nature of the Signal* made :—

Code Flag over one flag is an urgent signal. One flag held in hand over gunwhale is for vessels towing or being towed. Two flag signals are urgent signals.

Three flag signals relate to :—Compass, Money, Weights and Measures, Decimals and Fractions, Auxiliary Phrases, and all ordinary signals which are found in the General Vocabulary. Three flags with code pennant on top or below, are special signals. (See below)

TO BE FOUND AT THE BEGINNING OF SIGNAL						**MIDDLE.**	**Will be found at the latter end of Part 1. (SIGNAL BOOK)**					
CODE FLAG OVER ONE FLAG.						THREE FLAGS.			FOUR FLAGS.			
Alphabetical Spelling Signals.			**Numeral Signals**			**Ordinary Signal. General vocabulary**	**Code Flag over two. Lat. Long. Time Bar. & Ther.**	**Code Flag under two Alternative Numeral Table**	**A or B uppermost Geo-graphical Signals**	**C uppermost Alternative Spelling Table**	**Square Flag uppermost. Merchant Ships**	**G uppermost Men-of-War.**
No. 1	**No. 2**	**No. 3**	**No. 1.**	**No. 2**	**No. 3**							
E 	F 	G 	M 	N 	O 	M C H 	E W 	Z P 	A F L R 	C F X H 	M R C L 	G S M K 
Going to spell	**Finish of word or initial**	**Finished spelling**	**Going to hoist a number**	**Decimal point**	**Finished making numbers**	**Engines broken down**	**38° Long.**	**500,000**	**Sunderland**	**Ciz**	**Cairnavon of Newcastle**	**Magnificent (Bat.) 16 guns**

Published by Thomas Reed & Co., Ltd., 184 High Street West and 64 Nile Street, Sunderland.

Latitude and Longitude ...	pages	415 and 416
Hours, minutes, and seconds of time	,,	417
Barometer and Thermometer ...	,,	418 to 420
Numeral Table	,,	421

Four Flags:—

Geographical Signals (to read them)	pages	422 to 467
,, ,, (to make them)	,,	468 to 515b
Alphabetical Spelling Table	,,	516 to 534

Distant, Semaphore and Morse Code Signals, Part II.

Ships names and Men of War are read from the "British Code List," which is a separate book.

HINTS ON MAKING SIGNALS.

1. All the sentences and parts of a sentence in the "General Vocabulary" will be found under the principal word in the sentence, as all the words are arranged in alphabetical order, and the sentences where these words are in will be found under that particular word.

Rule.—To find any word or sentence.

Look for the principal word in the sentence, and under that word will be found the signal required. If it cannot be got under one word, try another.

2. In the middle of the "Signal Book" will be found a piece of green tape, and when the book is opened to this place, the index for all the different kind of signals will be seen at pages 272 and 273.

Note.—All candidates should be able to turn to any particular signal without the aid of this index.

3. Code Flag Signal over E indicates—A word is going to be spelt.
,, ,, F ,, —Finish of word, or dot between initials
,, ,, G ,, —Spelling finished, next Signal usual Code.

Code Flag Signal over M indicates—A number is going to be hoist.

" " N " —A decimal point.

" " O " —Numbers finished, next Signal usual Code.

" " Any one Flag indicates—Urgent Signal.

A Flag held in the hand above the gunwale indicates an urgent Signal, between vessels towing or being towed.

4. Code flag over two flags indicates latitude, longitude, hours, minutes, and seconds of time; barometer and thermometer.

5. Code Flag under two flags indicates alternative numeral table.

Note.—All special Signals are at the beginning or end of the book, and the ordinary Signals which are found in the Vocabulary will be either two or three flag Signals without the Code Flag.

6. When another ship is signalling you, keep the Answering Pennant flying, "close up" when you understand, and at the dip ($\frac{2}{3}$ of the way up) when waiting for the next signal.

EXAMPLES.

1. Spell—Charles Brown.

Method I. (Page 6.)

1st.—Code Flag over E = Going to spell.

$$\left.\begin{array}{l}\text{2nd.—CHAR}\\ \text{3rd.—LES}\end{array}\right\} = \text{Charles.}$$

4th.—Code Flag over F = Finish of word.

$$\left.\begin{array}{l}\text{5th.—BRO}\\ \text{6th.—WN}\end{array}\right\} = \text{Brown}$$

7th.—Code Flag over G = Finished spelling.

METHOD II. (Page 516.)

1st.—CFTK = Cha
2nd.—CTYZ = rl } Charles
3rd.—CJFX = es
4th.—Code Flag over F
5th.—CFMH = Bro } Brown
6th.—CZFR = wn

2. 1903.

METHOD I. (Page 7.)

1st.—Code Flag over M = Going to make a number.
2nd.—AIUC = 1903.
3rd.—Code Flag over 0 = Finish of numbers.

METHOD II. (Page 421.)

1st.—Code Flag under YJ = 1000
2nd.— ,, ,, YI = 900
3rd.— ,, ,, UD = 3

1903

3. N 28° E = ACG.
4. Dollar = ATJ.
5. Gallon = AYW.
6. ·01 or $\frac{1}{100}$ = BCP.
7. They are from (Auxiliary phrase) = BET.
8. Engines broke down, I am disabled = BJ, which can be found under Broke—n, also Disable—ing—ility.
9. Deepest water is nearer the shore = KQV, which can be found under: Water, Shore (the shore), Near—ed—ing, Deep—en—ed—ing.
10. 37° Latitude = Code Flag over BO.
11. Long. 136° = ,, ,, IU.
12. 21 hours = ,, ,, LM.

13. 30 seconds = Code Flag over PG.
14. 59 minutes = ,, ,, NZ.
15. 28° Fah. = ,, ,, VI.
16. 29·0 inches (Bar) ,, ,, RT.
17. 90,000 = ,, under ZK.
18. Dungeness = AELB.
19. Quebec = BDTA.
20. GSMW = Mars, tw, sc, bat, sh.
21. KVGW = Cyrene of Sunderland.

DISTANT AND SEMAPHORE SIGNALS.

Part II.

1. Whenever a ship is becalmed or too far off to distinguish flags, Distant or Semaphore signals will have to be resorted to. There are several methods, the three principal being:—

   (*a*) By Cones, Balls and Drums.

   (*b*) By Balls, Square Flags, Pennants and Whefts.

   (*c*) By the Fixed Coast Semaphore.

2. Distant Signals are made from a ship by hoisting shapes, and from the shore by shapes or semaphore.

   (*a*) The shapes used are:—

   A Cone point upwards; A Ball; A Cone point downwards and a Drum.

   (*b*) A square flag may be substituted for the cone point upwards.

   A Ball.

   A pennant may be substituted for the cone point downwards, and a pennant with the fly tied to the halyards, or a wheft for a drum, (a wheft is any flag tied in the centre.)

   (*c*) In signalling by the Semaphore, the position of the arms represents the shapes.

3. To simplify the method of making and reading the above signals, the four positions of the arms and the four shapes have been numbered 1, 2, 3, 4. (See Plates I., II., III., IV., V., and VI.)

2. represents the "Preparative," "Answering," or "Stop" after each complete signal.

2. 2. represents Annul the whole signal.
1. 1. 2. ,, A
2. 1. 2. ,, I
2. 3. 3. ,, Q
4. 2. 1. ,, Code Flag Sign.
4. 2. 2. ,, Alphabetical Sign.
&c., &c.

The *disc* at the top of the Semaphore must be shown until the signal is completed.

The *indicator* at the bottom will distinguish No. 2 from No. 4.

4. Any signal that can be made by flags from Part I. can also be made by Distant or Semaphore.

The Code Flag Sign, Alphabetical Sign, Numeral Sign, as the case may be must always be hoisted first.

Example 1.—QDS in Part I. means "How does the land bear?" Make the same by Distant or Semaphore.

Code Flag Sign	Q	D	S	Stop
4. 2. 1.	2. 3. 3.	1. 2. 3.	2. 4. 1.	2.

Example 2.—AFLR from Part I. means "Sunderland." Make the same by Distant or Semaphore.

Code Flag Sign	A	F	L	R	Stop
4.2.1.	1.1.2	1.3.2.	2.2.1.	2.3.4.	2.

Example 3.—Spell "Oliver."

Alphabetical Sign	O	L	I	V	E	R	Finishing Sign
4.2.2.	2.3.1.	2.2.1.	2.1.2.	3.1.2.	1.2.4.	2.3.4.	4.3.2.

Example 4.—Make number 1893.

Numeral Sign	A	H	I	C	Finishing Sign
4. 2. 3.	1. 1. 2.	2. 1. 1.	2. 1. 2.	1. 2. 2.	4. 3. 2.
	1	8	9	3	

5. There are thirty-seven "Special Distant Signals" that can be made with one hoist only (See Signal Book, Part II, pages 541 to 547.) These Signals are not preceded by the Code Flag Sign, but in all cases the stop must immediately follow the hoist.

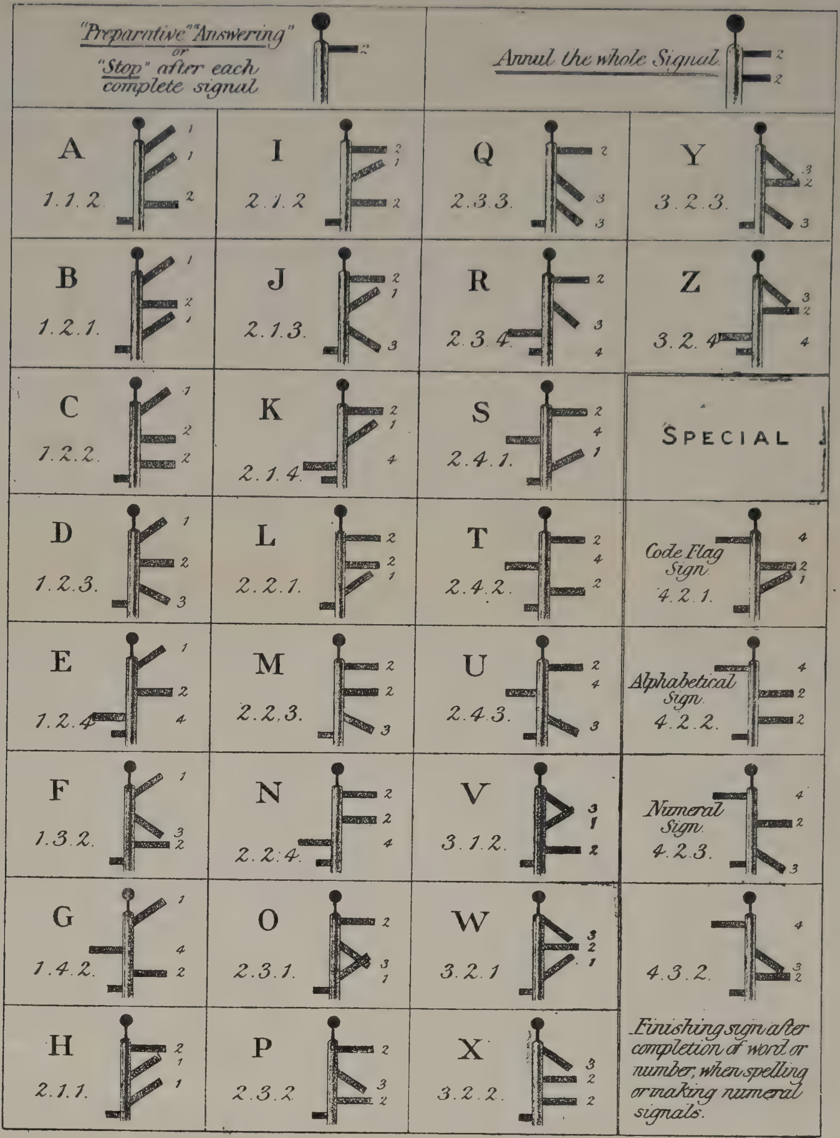
Example 1.—2. 4. 3. with 2. (stop) immediately following will be found to mean "Cyclone, Hurricane, or Typhoon expected."

Example 2.—2. 2. 3. followed by 2. (stop) will be fouud to mean "Want a tug; can I obtain one?"

ADDITIONAL METHODS OF SEMAPHORING.

To signal by the methods on plates VII., VIII., IX. and X., Part I. of the Signal Book is not required. All communications will be made by spelling, and should a number be required, the Semaphore will have to be put at the numeral sign and the number made. After the numeral signal is finished, the alphabetical sign is to be made and the communication by spelling proceeded with.

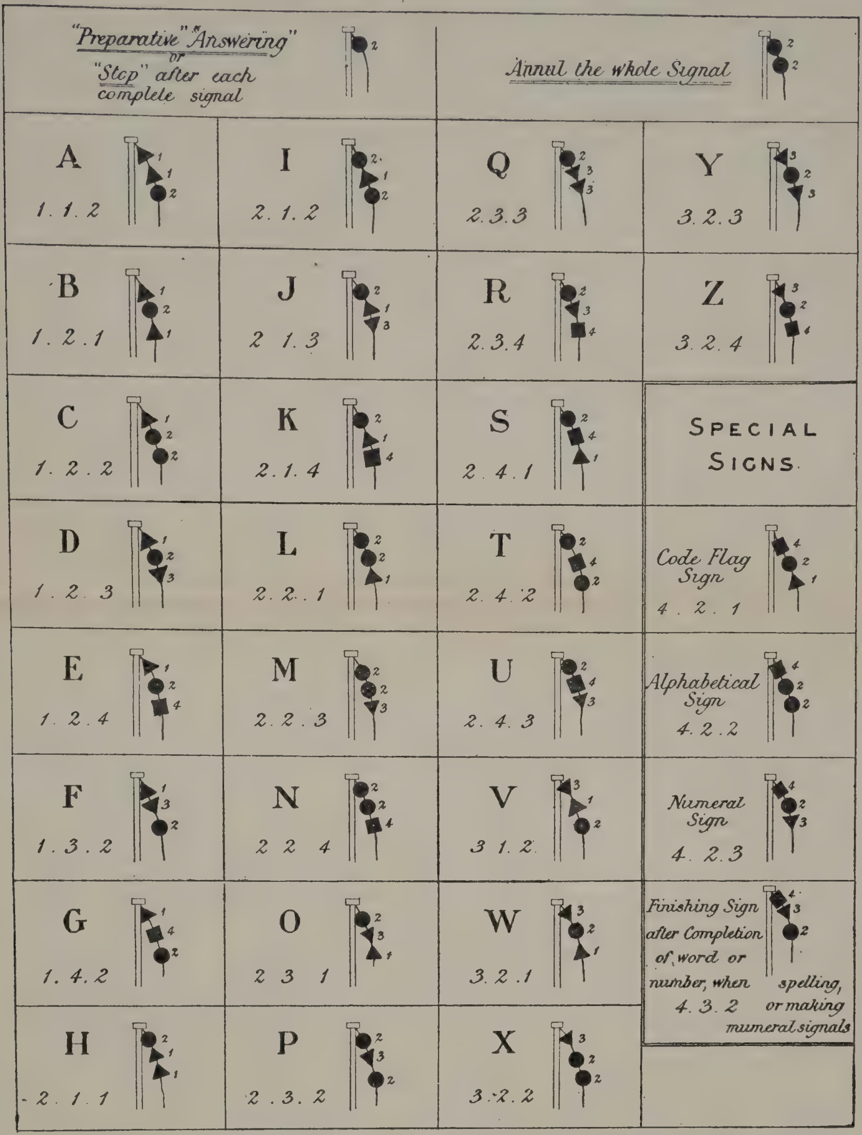
PLATE II.—GENERAL ALPHABETICAL TABLE FOR MAKING THE INTERNATIONAL CODE SIGNALS BY MEANS OF DISTANT SIGNALS BY FIXED SEMAPHORE.



"Preparative" "Answering" or "Stop" after each complete signal		Annul the whole Signal	
A 1.1.2.	I 2.1.2	Q 2.3.3.	Y 3.2.3.
B 1.2.1.	J 2.1.3.	R 2.3.4.	Z 3.2.4.
C 1.2.2.	K 2.1.4.	S 2.4.1.	SPECIAL
D 1.2.3.	L 2.2.1.	T 2.4.2.	Code Flag Sign 4.2.1.
E 1.2.4	M 2.2.3.	U 2.4.3.	Alphabetical Sign 4.2.2.
F 1.3.2.	N 2.2.4.	V 3.1.2.	Numeral Sign 4.2.3.
G 1.4.2.	O 2.3.1.	W 3.2.1	4.3.2.
H 2.1.1.	P 2.3.2	X 3.2.2.	Finishing sign after completion of word or number, when spelling or making numeral signals.

[TO FACE PAGE 230.]

Plate III.—General Alphabetical Table for making the International Code Signals by means of Distant Signals by Shapes.



"Preparative" "Answering" or "Stop" after each complete signal	2	Annul the whole Signal	2 2
A 1. 1. 2	**I** 2. 1. 2	**Q** 2. 3. 3	**Y** 3. 2. 3
B 1. 2. 1	**J** 2 1. 3	**R** 2. 3. 4	**Z** 3. 2. 4
C 1. 2. 2	**K** 2. 1. 4	**S** 2. 4. 1	SPECIAL SIGNS
D 1. 2. 3	**L** 2. 2. 1	**T** 2. 4. 2	Code Flag Sign 4. 2. 1
E 1. 2. 4	**M** 2. 2. 3	**U** 2. 4. 3	Alphabetical Sign 4. 2. 2
F 1. 3. 2	**N** 2 2 4	**V** 3 1. 2	Numeral Sign 4. 2. 3
G 1. 4. 2	**O** 2 3 1	**W** 3. 2. 1	Finishing Sign after Completion of word or number, when spelling, or making numeral signals 4. 3. 2
H 2. 1. 1	**P** 2. 3. 2	**X** 3. 2. 2	

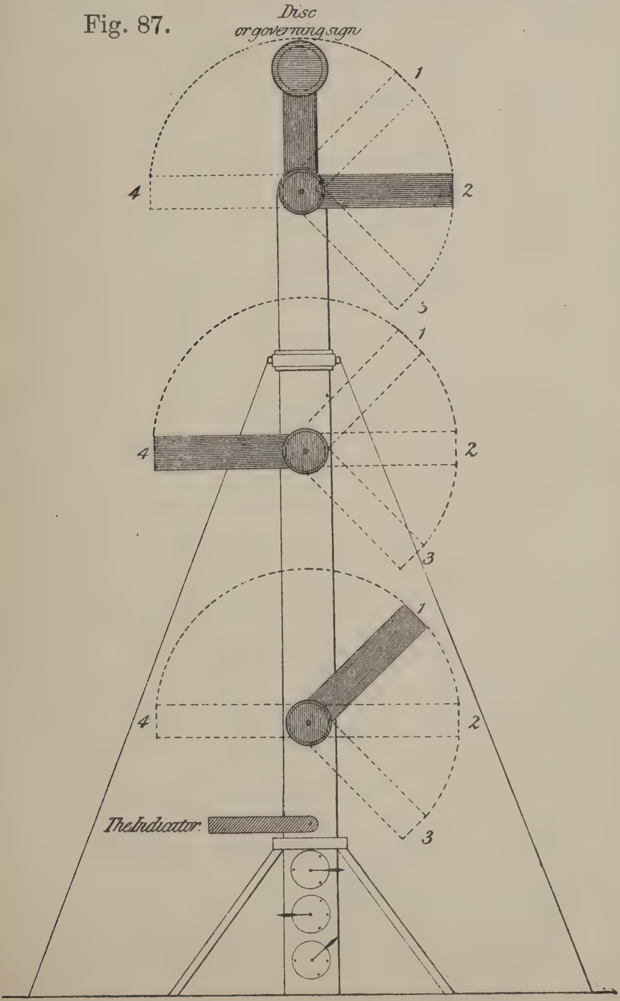
If no Cones are available, a square Flag may be substituted for the Cone point upwards, a Pennant for the Cone point downwards, and a wheft for the Drum.

DIAGRAMS.

The following plates are taken from the Signal Book, which is supplied to the Candidate when being examined in Signals.

Plate I.—Fixed Semaphore for Coast Signalling.

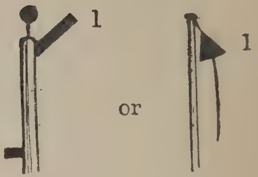
Fig. 87.



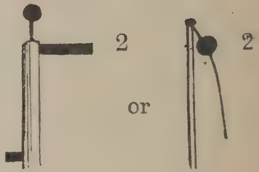
The signal shown on the Semaphore is **2. 4. 1.**

PLATE IV.

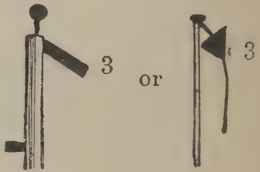
1 representing the Semaphore Arm pointing upwards, on the *opposite* side to the indicator, a Cone with the point upwards, or a square Flag.
Indicator.



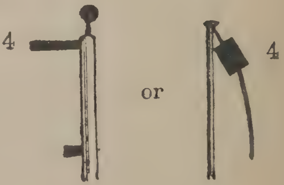
2 representing the Semaphore Arm pointing horizontally, on the *opposite* side to the indicator, or a Ball.
Indicator.



3 representing the Semaphore Arm pointing downwards on the *opposite* side to the indicator, a Cone with the point downwards, or a Pennant.
Indicator



4 representing the Semaphore Arm pointing horizontally on the *same* side as the indicator, a Drum or a Pennant with the fly tied to the halyards or a Wheft.
Indicator.



The stop Signal is to be made at the end of each complete signal.

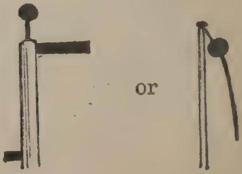
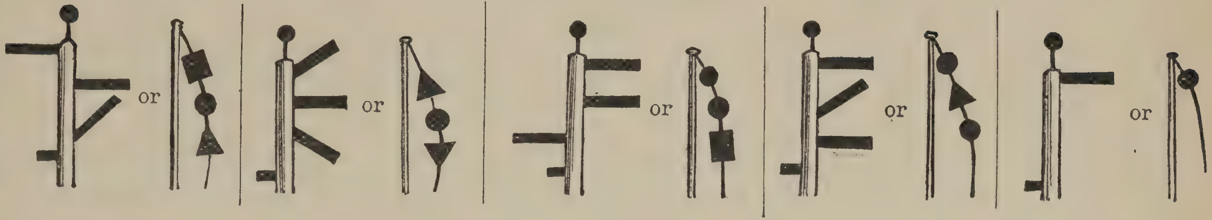


Plate V.—Example of a Signal from the International Code

made by Fixed Semaphore or by Distant Signals.



4 2 1—Code Flag Sign, indicating that the Signal which follows is taken from the General Vocabulary of the International Code.

1 2 3—D

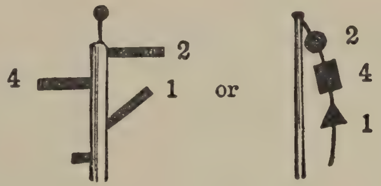
2 2 4—N

2 1 2—I

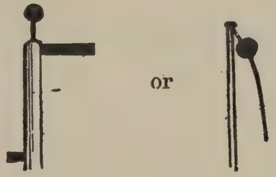
2—Stop, *i.e.*, Signal is ended.

Looking DNI out in the International Code, we find it to be "Pilot boat is advancing towards you."

PLATE VI.—EXAMPLE OF A SPECIAL DISTANT SIGNAL MADE BY SEMAPHORE OR DISTANT SIGNALS.



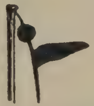
2 4 1



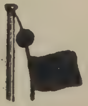
Stop

Looking 2 4 1 out in the Table of Special Distant Signals (page 543), we find it to be "Cannot distinguish your flags; come nearer, or make Distant Signals."

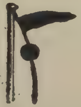
The following Distant Signals made with Flag and Ball, or Pennant and Ball, have the special signification indicated beneath them.



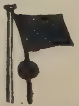
You are running into danger.



Fire, *or*, Leak; want immediate assistance.*



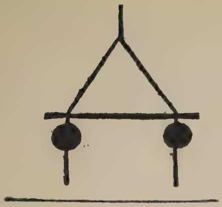
Short of provisions. Starving.



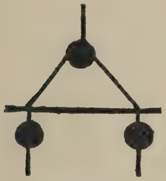
Aground; want immediate assistance.*

PLATE VII.

SIGNALS USED AT LLOYD'S SIGNAL STATIONS.



This signal indicates that the station at which it is hoisted is temporarily closed, and that no communication can be held.*

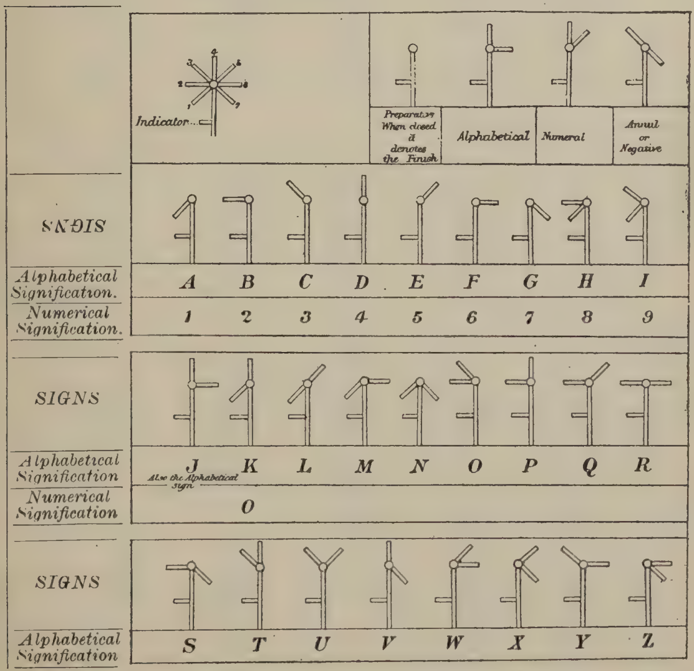


This signal indicates that telegraphic communication is interrupted, and that messages cannot be forwarded by telegraph, but will be forwarded by other means as soon as possible.*

* These signals will be kept up until the signal station is again occupied, or until telegraphic communication is again possible.

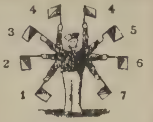
THE BRITISH MOVABLE SEMAPHORE.

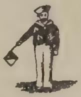
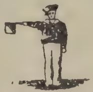
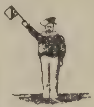
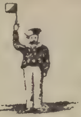
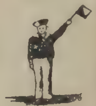
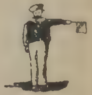
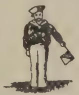
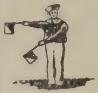
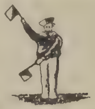
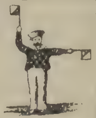
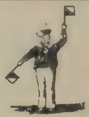
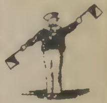
Semaphore Signs. Governing Signs.



Note.—If a numeral signal is to be followed by words; the end of the numerical signification of the signs, is shown by the Alphabetical sign being made, indicating that spelling is again to commence.

Plate VIII.—British Method of Semaphoring by Hand Flags.



SIGNS						
Alphabetical Signification	A	B	C	D	E	F
Numerical Signification	1	2	3	4	5	6
SIGNS						
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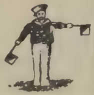
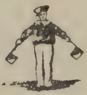
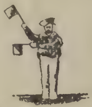
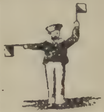
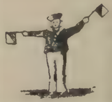
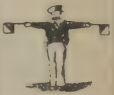
Numerical Signification	7	8	9	ALSO ALPHABETICAL SIGN.	0	
SIGNS						
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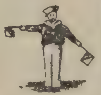
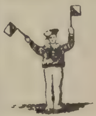
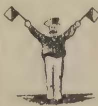
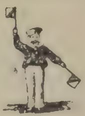
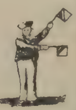
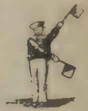
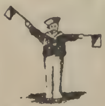
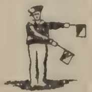
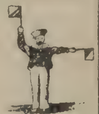
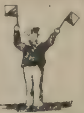
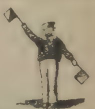
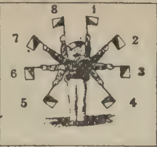
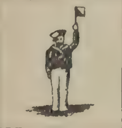
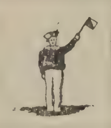
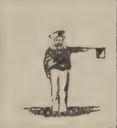
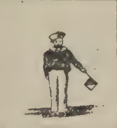
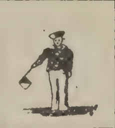
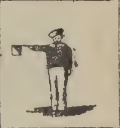
SIGNS						
Alphabetical Signification	S	T	U	V	W	X
SIGNS						
Signification	Y	Z.		ALPHABETICAL.	NUMERAL.	ANNUL.

Plate IX —French Method of Semaphoring by Hand Flags.



SIGNS						
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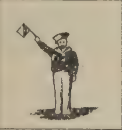
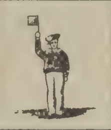
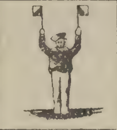
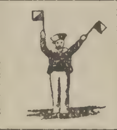
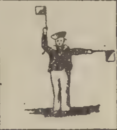
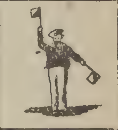
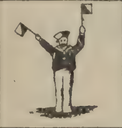
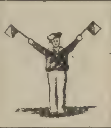
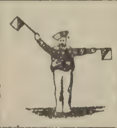
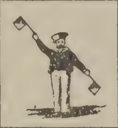
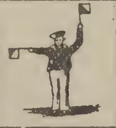
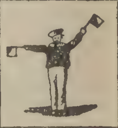
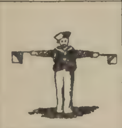
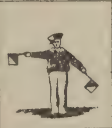
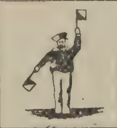
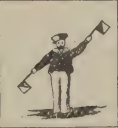
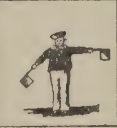
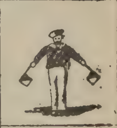
Numeral Signification	1	2	3	4	5	6
SIGNS						
Alphabetical Signification	G	H	I	J	K	L
Numeral Signification	7	8	9	0		
SIGNS						
Alphabetical Signification	M	N	O	P	Q	R
SIGNS						
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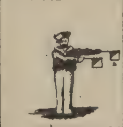
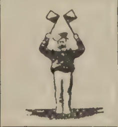
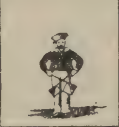
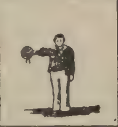
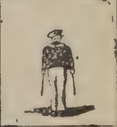
SIGNS						
Signification	Z		DO NOT UNDERSTAND.	NUMBERS.	ATTENTION.	END OF WORD OR PHRASE.

Note.—The W is made by means of two consecutive V's.

To indicate the finish of a Numerical Signal the Number sign is again made: thus the number sign begins and ends Numerical Signals.

THE MORSE CODE.

Flag Waving.

Instructions for communicating by flashing Signals with a Flag (generally termed flag waving.)

The system used is the Morse Alphabet, the letters being made by groups of LONG and SHORT flashes caused by moving a flag through a long or short arc, as described below.

The Signalman may work from left to right, or from right to left, as shewn in figures 1 and 2, according to convenience and direction of the wind.

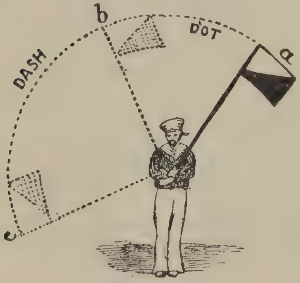


FIGURE 1.

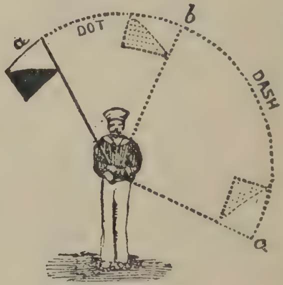


FIGURE 2.

In the normal position (*a*) in the above figures the flag should make an angle of 25° with a vertical line through the centre of the body.

The pole should be kept high enough to permit seeing underneath the flag while in motion.

To make a Short Flash or Dot.

The flag is waved from *a* to *b*, and without any pause back again to the normal position.

To make a Long Flash or Dash.

The flag is waved from *a* to *c*, and after a short but distinct pause at *c*, brought back to the normal position.

When Signalling a Letter.

When signalling a letter the flashes representing it should be made in one continuous wave of the flag, taking particular care that no pause is made when at the normal position.

Example.—To make R ▪ ▬ ▪ wave the flag from *a* to *b* back to *a* and without a pause down to *c*, making there a short but distinct pause (*vide* instructions for long flash), back to *a*, then without a pause to *b* and back to the normal position *a*.

MORSE SIGNAL CHARACTERS.

Light and Sound Signals.

▬ indicates a long of about 3 seconds duration.
▪ ,, short ,, 1 second ,,

Preparative Signal to attract attention ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ etc.

Answering Signal, *or*, I understand ▬ ▪ ▬ ▪ ▬ ▪ ▬ ▪ etc.

Interval between each flash or sound . . . 1 second
,, ,, ,, letter . . . . 3 seconds
,, ,, ,, word . . . . 6 ,,

A . .	▪ ▬	N . .	▬ ▪
B . .	▬ ▪ ▪ ▪	O . .	▬ ▬ ▬
C . .	▬ ▪ ▬ ▪	P . .	▪ ▬ ▬ ▪
D . .	▬ ▪ ▪	Q . .	▬ ▬ ▪ ▬
E . .	▪	R . .	▪ ▬ ▪
F . .	▪ ▪ ▬ ▪	S . .	▪ ▪ ▪
G . .	▬ ▬ ▪	T . .	▬
H . .	▪ ▪ ▪ ▪	U . .	▪ ▪ ▬
I . .	▪ ▪	V . .	▪ ▪ ▪ ▬
J . .	▪ ▬ ▬ ▬	W . .	▪ ▬ ▬
K . .	▬ ▪ ▬	X . .	▬ ▪ ▪ ▬
L . .	▪ ▬ ▪ ▪	Y . .	▬ ▪ ▬ ▬
M . .	▬ ▬	Z . .	▬ ▬ ▪ ▪

Morse Code Warning Signals, see pages 65 and 66.

QUESTIONS RELATING TO CYCLONES.
FOR MATES AND MASTERS.

The Candidate must answer in writing, on paper supplied to him by the Examiner, the following questions, numbering the answers to correspond with the questions.

1. The direction of the wind in a cyclone being* South; state the probable bearing of its centre from the ship in the Southern Hemisphere.

The probable bearing of its centre would be between East and ENE.

2. And suppose that the wind during the passage of the same cyclone were found to change towards the* SE, what would be the ship's position with reference to the line of progression of the centre of the cyclone, and what action would you take?

The ship would be on the left-hand side of the line of progression, and I should heave to on port tack (if necessary).

3. Under what conditions would the change in the direction of the wind in the cyclone be the reverse of the above?

If the ship were in the oppposite semi-circle, or on the same side going faster than the cyclone in the same direction.

4. What are the usual indications of a ship being on the line of progression of the centre of a cyclone?

Barometer falling, sea getting worse, wind increasing in violence but never changing, and threatening appearance of the weather.

5. What are the usual indications that a ship is (*a*) approaching the centre of a cyclone, (*b*) receding from it?

(*a*) Barometer falling; sea getting worse; wind increasing in violence and changing at short intervals; terrific squalls, and threatening appearance of the weather. (*b*) Barometer rising; sea still dangerous; wind abating and appearance of better weather.

6. Describe the track usually taken by cyclones in the † , and state the seasons of the year in which they most frequently occur in that region.

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* These spaces to be filled in by the Examiners, and frequently varied.

† The Examiners to fill in whether North Atlantic, Bay of Bengal, China Sea, Indian Ocean, &c., &c.

North Atlantic and West Indies.

They begin in about 10° N and travel in a W N W and N W direction towards the West Indies, recurving in about 25° N, and proceeding towards the N E, sometimes as far as Europe. Seasons, July to November.

NOTE.—Cyclones in the North Pacific travel the same as in the North Atlantic, beginning and recurving in the same Latitudes, the seasons being also the same.

China Sea.

The tracks are generally between N W and W S W. Seasons, July to November.

Arabian Sea, Bay of Bengal, and Persian Gulf.

The tracks are generally towards the WNW and NW. Seasons, April, May, June, and again in October & November.

South Indian Ocean and Mauritius.

They begin in about 10° S and travel in a WSW and SW direction towards the Mauritius, recurving in about 25° S, and proceeding towards the SE. Seasons, December to May.

NOTE.—Cyclones in the South Pacific travel the same as in the South Indian Ocean, beginning and recurving in the same Latitudes, the seasons being also the same.

Rule for question 1.

Allow 8 to 10 points to the right of the bearing in the Northern Hemisphere, and to the left in the Southern Hemisphere.

Rule for question 2.

If the wind change to the right in either hemisphere, the ship will be on the right hand semi-circle, and you heave to on the starboard tack (if necessary). If the wind change to the left the ship will be on the left hand semi-circle, and you heave to on the port tack (if necessary).

DEVIATION OF THE COMPASS.

Candidates will be required to give correct written answers to at least 12 of the following questions; these will be marked with a cross by the Examiner.

The Examiner's attention is specially called to the importance of Questions 11, 12, 13, 14, and 39, which must be marked in all cases. The other questions must be *constantly* varied.

1. State briefly the essentials of an efficient Compass?

It should be sensible and steady in its action, simple in construction having two or more short needles with little weight, great directive power, and consequently little friction. The magnetic axis of the needles should be parallel with the North and South points of the card, the cap should be fitted with a ruby or an agate free from punctures, and the pivot, hard, sharp, and free from rust. A compass bowl should be made of pure copper.

2. State briefly the chief points to be considered when selecting a position for your compass on board ship, and what should be particularly guarded against?

It should be placed in the middle line of the ship, easily accessible at all times, raised at such a height to permit bearings to be conveniently observed, and as far as possible from dynamos, and any considerable mass of iron, especially if vertical.

3. What do you mean by Deviation of the Compass and how is it caused?

Deviation is the angle between the Compass needle and the magnetic meridian, caused by the attraction of iron in the ship.

4. Describe how you would determine the deviation of your compass, (1) by reciprocal bearings; (2) by figures on the dock walls; (3) by bearings of a distant object; (4) by the bearings of the sun or other celestial body.

(1) A compass is taken on shore and placed clear of all local attraction, the ship is swung and bearings taken with both ship's and shore compass at the same instant, the shore compass bearings reversed are correct magnetic, (2) At Liverpool, Vauxhall Chimney in a line with any of the figures on the dock walls gives the true bearings of the chimney, the variation applied making them magnetic, (3) determine the correct magnetic bearing of the distant object by a compass on shore, or by swinging the ship and taking the mean of the compass bearings, (4) the true bearing of the celestial body having been computed, apply the variation which will give the correct magnetic bearing. In all the above cases the difference between the correct magnetic bearing and the compass bearing will be the deviation on the ship's head.

5. Having determined the deviation with the ship's head on the various points of the Compass, how do you know when it is Easterly and when Westerly?

If the correct magnetic bearing be to the right of the compass bearing, the deviation will be East; if to the left West.

6. Why is it necessary, in order to ascertain the deviations, to bring the ship's head in more than one direction?

Because the deviation alters on every point of the ship's head by compass.

7. For accuracy, what is the least number of points to which the ship's head should be brought for constructing a curve or table of deviations? Eight. Equi-distant.

8. How would you find the deviation when sailing along a well known coast?

By finding the difference between the known correct magnetic bearing of two well defined objects in one line and the compass bearing.

9. Name some suitable objects by which you could readily obtain the deviation of the compass when sailing along the coasts of the Channel you have been accustomed to use.

The following objects in a line:—Tyne leading lights, Portland lights, Prawle point and Start, or any two objects in a line whose magnetic bearings are known.

10. Supposing you have no means of ascertaining the magnetic bearing of a distant object when swinging your ship for deviations, how could you find it, approximately, from equi-distant compass bearings; and at what distance as a rule should the object be from the ship?

The mean value of the equi-distant compass bearings will give the magnetic bearing. The distance from the object should be not less than 6 miles, or at such a distance that the diameter of the space through which the ship swings, will make no sensible difference in the magnetic bearing.

Note.—Rules for questions 11, 12, 13, 14, see "Reed's New Guide Book." (Napier's diagram.)

11. *Example:*—Having taken the following compass bearings of a distant object, find the object's magnetic bearing, and thence the deviation.

MAGNETIC BEARING REQUIRED:—S 8° E.

Ship's Head by Standard Compass.	Bearing of distant object by Standard Compass.	Deviation required.	Ship's Head by Standard Compass.	Bearing of distant object by Standard Compass.	Deviation required.
North	S 4° E	4° W	South	S 13° E	5° E
N E	South	8 W	S W	S 23° E	15 E
East	S 4° W	12 W	West	S 21° E	13 E
S E	S 1° W	9 W	N W	S 11° E	3 E

12. With the deviations as above, construct a curve of deviations on a Napier's diagram, and give the courses you would steer by the Standard Compass to make the following courses, correct magnetic.

Magnetic courses. S.S.W. W.N.W. N.N.E. E.S.E.

Compass Courses required.

S 13½° W. N 78½° W. N 29°½ E. S 56½° E.

13. Supposing you have steered the following courses by the Standard Compass, find the correct magnetic courses made from the above curve of deviations.

Compass Courses. W.S.W. N.N.W. E.N.E. S.S.E.

Magnetic courses required.

S 84° W. N. 24° W. N 57° E. S 26° E.

14. You have taken the following bearings of two distant objects by your Standard Compass as above; with the ship's head at W ½ S, find the bearings correct magnetic.

Compass bearing W. by S. and N. ¾ W.

Magnetic bearings required N. 87° W. N. 6° E.

15. Do you expect the deviation to change; if so, state under what circumstances?

Yes; it changes rapidly in a new ship, by change of latitude, heeling over, collision, stranding, very heavy seas, cargo of iron, and by an alteration of the course steered for a long time.

16. How often is it desirable to test the accuracy of your table of deviations?

Every watch when possible, especially when nearing land, and under circumstances stated in question 15.

17. What is meant by variation of the Compass; what is it caused by; and where can you find the variation for any given position?

Variation is the angle between the true and magnetic meridians, caused by the magnetic poles not coinciding with the geographical. It may be found for any position on Captain Evans' variation chart.

18. The earth being regarded as a magnet, which is usually termed the blue, and which the red magnetic pole?

The north magnetic pole of the earth is termed the blue, and the south the red.

19. Which end of a magnet (or compass needle) is usually termed the red or "marked" end, and which the blue?

The north end of a magnet (or compass needle) is termed the red, and the south the blue.

20. What effect has the pole of one magnet of either name on the pole of another magnet?

Poles of the same name repel, and opposite names attract.

21. What is meant by transient induced magnetism?

Magnetism induced in soft iron, which it loses on the position being altered. When a ship is kept for a considerable period with her head in a different direction to being built, a change will take place in her magnetic condition, especially if she be subjected to concussion. This change is very transient in duration, when compared with sub-permanent magnetism.

22. Which is the red and which is the blue pole of a mass of soft vertical iron, by induction, and what effect would the upper and lower ends of it have on the compass needle (*a*) in the Northern hemisphere, (*b*) in the Southern hemisphere, (*c*) on the magnetic Equator?

(*a*) The lower end is red and repels the red end of the needle, the upper is blue and attracts. (*b*) The lower end is blue and attracts the red end of the needle, the upper red and repels. (*c*) Is neutral and has no effect, unless retaining previously induced magnetism.

23. Describe what is usually termed the sub-permanent* magnetism of an iron ship, and state when and how it is acquired and which is the red and which is the blue pole, and why it is called sub-permanent magnetism?

Sub-permanent magnetism is first acquired from the earth's inductive influence while the ship is being built, and owing to the hammering remains after she is launched, although it undergoes a considerable reduction, especially through concussion with her head in a different direction to being built, for this reason it is called sub-permanent. The red sub-permanent pole is that part of the hull which was nearest the north magnetic pole of the earth while building, and the blue the opposite extremity of the ship.

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*The term sub-permanent magnetism in these questions is used in the original sense, as proposed by the late Sir G. B. Airey, to denote the character of the permanent magnetism of an iron ship as distinguished from the permanent magnetism of a magnetised steel bar. The terms "sub-permanent" and "permanent" throughout these questions, may therefore, be considered synonymous.

24. Describe the meaning of the expression co-efficient A ?

Co-efficient A is a constant deviation of the same name and amount for any direction of the ship's head, + A signifying Easterly and —A westerly deviation. It may be caused through the lubber line being misplaced, or an error in the construction of the compass card.

25. Describe the meaning of the expression co-efficient B its signs and effects ?

Co-efficient B represents the fore and aft component of the sub-permanent magnetism, + B representing a force which attracts the north end of the needle towards the bow, and—B towards the stern. It gives semi-circular deviation, and has the greatest amount of deviation at East or West, and none at North or South. +B gives Easterly deviation in the East semi-circle and Westerly in the West semi-circle, —B gives the reverse.

26. Describe the meaning of the expression co-efficient C its signs and effects ?

Co-efficient C represents the athwartship component of the sub-permanent magnetism, +C representing a force which attracts the north end of the needle towards the starboard side, and —C towards the port side. It gives semi-circular deviation, and has the greatest amount of deviation at North or South and none at East or West. + C gives Easterly deviation in the North semi-circle and Westerly deviation in the South semi-circle,—C gives the reverse.

27. Describe the meaning of the expression co-efficient D its signs and effects ?

Co-efficient D represents magnetism induced in athwartship or fore and aft horizontal iron, and produces quadrantal deviation, having the greatest deviation on the quadrantal and none on the cardinal points, +D from continuous athwartship or divided fore and aft beams, and — D from divided athwartship or continuous fore and aft beams. + D gives Easterly deviation in the NE and SW quadrants, and Westerly in the NW and SE quadrants,—D gives the reverse.

28. Describe the meaning of the expression co-efficient E its signs and effects ?

Co-efficient E represents magnetism induced in horizontal iron unsymmetrically arranged near the compass, + E gives Easterly deviation in the North and South quadrants and Westerly deviation in the East and West quadrants, — E gives the reverse.

29. Would you expect any change to be caused in the error of your compass by the ship heeling over either from the effect of the wind or the cargo, &c. ?

Yes ; from sub-permanent magnetism below the compass, and vertical induction in soft iron.

30. The compasses of iron ships being more or less affected by what is termed the heeling error, on what courses is this error usually at its minimum, and on what courses at its maximum ?

Minimum at East or West, and maximum at North or South.

31. Describe clearly the three principal causes of the heeling error on board ship.

(1) Vertical force from the sub-permanent magnetism.
(2) Vertical induction in vertical soft iron, and
(3) Vertical induction in horizontal iron beams.

When the ship heels over the vertical force from sub-permanent magnetism and vertical soft iron below the compass is altered towards the high side and attracts or repels the needle, and the transverse iron becoming inclined to the horizon acquires vertical induction.

32. State to which side of the ship in the majority of cases is the North point of the compass drawn when ship heels over in the Northern hemisphere. High side.

33. Under what conditions (that is, as regards position of ship whilst building, and the arrangement of iron in the ship) is the North point of the compass needle usually drawn to windward or the high side of the ship in the Northern hemisphere, and if not allowed for, what effect has it on the assumed position of the ship when she is steering on Northerly, also on Southerly courses in the Northern hemisphere ?

Ships in the Northern hemisphere, built with their heads between SW and SE by way of North and having continuous athwartship beams (compass aft) will have the North end of the compass needle drawn towards the high side, and if not allowed for will take the ship to windward on northerly courses, and to leeward on southerly courses.

34. Under what conditions (as in Question 33) is the North point of the compass needle usually drawn to leeward

or the low side of the ship in the Northern hemisphere, and if not allowed for, what effect would it have on the assumed position of the ship, when she is steering on Northerly also on Southerly courses in the Northern hemisphere ?

Ships in the Northern hemisphere, built with their heads between SW and SE by way of South, and having divided athwartship beams with a compass placed between, (compass aft) will have the red end of the needle repelled to leeward, and if not allowed for will take the ship to leeward on northerly courses, and to windward on southerly courses.

35. The effects being as you state, on what courses would you keep away, and on what courses would you keep closer to the wind in the Northern hemisphere in order to make good a given compass course, (*a*) when north point of compass is drawn to windward or the high side of ship ; and (*b*) when drawn to leeward or the low side ?

(*a*) Keep away on northerly courses, and closer to the wind on southerly courses. (*b*) Reverse to (*a*)

36. Does the same rule hold good in both hemispheres with regard to the heeling error ?

The same rule will hold good in the preceding question (Question 35), but the heeling error caused by vertical induction will be reversed in the opposite hemisphere.

37. State clearly how that part of the heeling error due to the permanent part of the magnetism of the ship varies as the ship changes her position on the globe, and what is the reason of this ?

It varies inversely as the earth's horizontal force, and consequently is greatest in high latitudes, diminishes as the ship approaches the magnetic equator where it is least, and increases again in the opposite hemisphere, still retaining the same name. The reason of this is because the directive force of the needle is greatest at the magnetic equator.

38. State clearly how that part of the heeling error due to the induction in transverse iron (which was horizontal when ship was upright) and iron vertical to the ship's deck, varies as the ship changes her position on the globe ?

Decreases as the ship approaches the magnetic equator where it is zero, and is of a contrary name in the Southern Hemisphere.

39. Your steering Compass having a large error, show by "Beall's Compass Deviascope" *(see Page 250)* how you would correct it by compensating magnets and soft iron (as usually

practised by compass adjusters in the Mercantile Marine) in order to reduce the error within manageable limits. Show also how the heeling error can be compensated ?

To be shown on the Deviascope. *(See Page 255).*

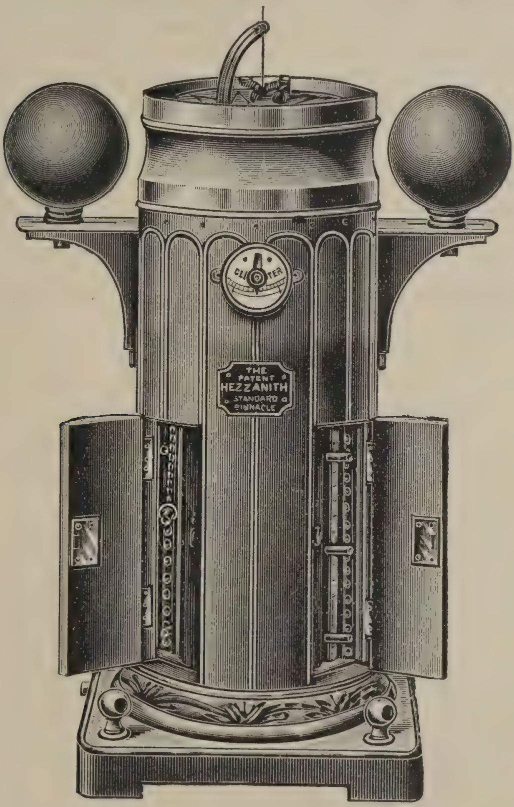


Fig. 88.

Binnacle shewing soft iron correctors, and holes for the sub-permanent magnetism correctors.

See that the ship is upright, then bring the ship's head North or South (cor. mag.) to correct co-efficient C; place a magnet with its centre on the fore-and-aft line, and parallel to the athwart-ships line. Move it to or from the Compass till the compass shows the ship's head North or South. Bring the ship's head East or West, (cor. mag.) to correct co-efficient B; place another magnet with its centre on the athwart-ships line, and parallel to the fore-and-aft line. Move it to or from the compass till the compass shows the ship's head East or West. The North poles of these magnets should point in the same direction as the North of the needle is drawn. Bring the ship's head NE, SE, SW, or NW, (cor. mag.) to correct co-efficient D; place two soft iron globes, one to port, the other to starboard of the compass (+D), and on the same level with it; move them towards the compass till the compass is again correct.

Diagrams showing how these magnets and soft iron globes are placed.

1st Diagram. Ship's head North or South (Cor. Mag.)

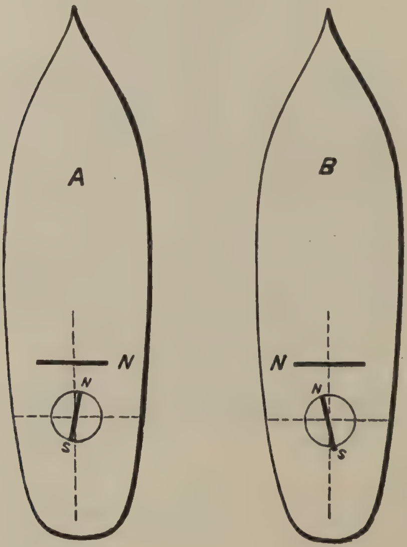


Fig. 89. Fig. 90.

+C —C

Co-efficient C, the athwartship component of the sub-permanent magnetism.

In A, the North point of the Compass is drawn towards the starboard side (+C), the compensating magnet's North pole must point also towards the starboard side.

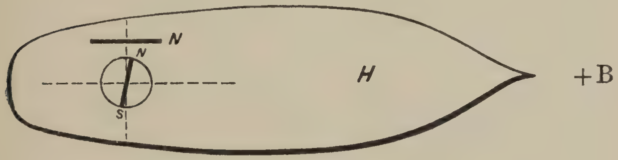
In B, the North point is drawn towards the port side of the compass (—C), the compensating magnet's North pole must point also towards the port side.

2nd Diagram. Ship's head East or West (Cor. Mag.)

In H, the North point of the compass is drawn towards the bow (+B), the compensating magnet's North pole must also point towards the bow.

In K, the North point of the Compass is drawn towards the stern (—B), the compensating magnet's North pole must also point towards the stern.

Fig. 91.



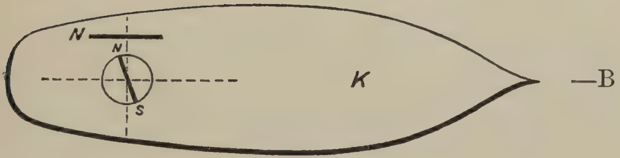


Fig. 92.

Co-efficient B, the fore-and-aft component of the sub-permanent magnetism. (Figs. 91 & 92.)

Note.—Co-efficient B consists of two parts, one due to sub-permanent magnetism which has just been corrected, and the other due to induction in vertical soft iron, which will have to be corrected with a soft iron bar at the opposite side of the compass.

3rd Diagram. Ship's head NE (Cor. Mag.)

M represents the quadrantal deviation. When the ship's head is placed NE or SW, the North point of the compass is drawn to the right as in the diagram; but when her head is NW or SE, the North point of the compass is drawn towards the left, (+D.)

In our diagram the soft iron globe *(a)* draws the North point back towards the left, and the globe *(b)* draws the South point to the right, and consequently turns the North point also to the left.

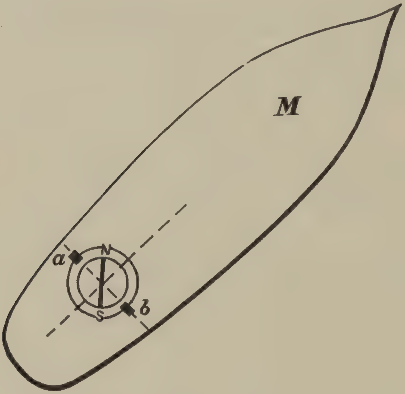


Fig. 93.

Note. In case of —D the globes would go fore and aft.

The above methods of correcting the compass are on the supposition that the ship is upright. If she heels over to port or starboard, the deviation changes, because the iron that was vertical is now not quite vertical, and that which was horizontal is no longer so; the sub-permanent magnetism below the compass is also changed to windward.

This heeling error can be compensated for by placing a magnet under the centre of the card at right angles with the deck.

Put the ship's head North or South and heel her over about 10° to starboard or port; then put the magnet in the place prepared for it in the underneath part of the binnacle, moving it up or down till the compass is corrected.

When a ship heels, it is found that the North of the compass needle is drawn to the weather side, in which case the compensating magnet must have its North pole upwards (Fig. 94,) but in the few cases where the compass needle is drawn to leeward this magnet must have its South pole upwards (Fig. 95.)

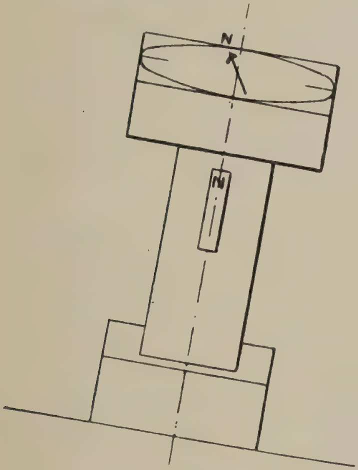


Fig. 94.

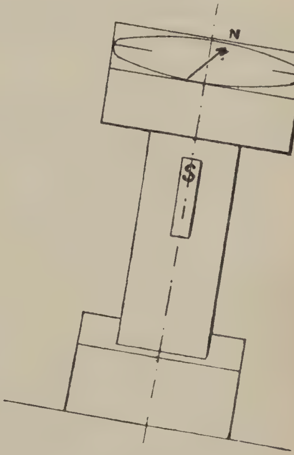


Fig. 95.

40. As the co-efficient B (capable of being corrected) usually consists of two parts, one due to the permanent magnetism of the ship, and the other to vertical induction in soft iron, how should each of the two parts, strictly speaking, be corrected when compensating the compass ?

That part due to permanent magnetism should be corrected with a bar magnet, and vertical soft iron with the Flinders bar.

41. If the whole of the co-efficient B be corrected by a permanent magnet, as is usually done, what is likely to ensue as the ship changes her magnetic latitude ?

+ B or — B will probably appear, because the induction in vertical iron changes with the latitude, increasing when the ship is going from, and decreasing when the ship is going towards the Magnetic Equator, changing the name in the opposite Hemisphere.

42. Provided the needles of your compass are not so long and powerful, and so near, as to cause the soft iron correctors to become magnetised by induction, would the co-efficient D if properly compensated be likely to remain so in all magnetic latitudes and both hemispheres. If so, state the reason why ?

Yes, for although the intensity of inductive magnetism changes with the latitude, the ratio between the directive force and disturbing force remains the same.

43. State at what distance, as a general rule, the magnets and soft iron correctors should be placed from the compass needles, and what will be the consequence if they are placed too near the needles ?

The magnets ought not to be placed within twice their own length from the needles, and the soft iron correctors not within $1\frac{1}{4}$ the length of the needles from the centre of the compass. If too near, the result would be abnormal deviations. (The needles would induce magnetism into the soft iron correctors.)

44. Is it necessary that the magnets used for compensating co-efficients B and C should be placed on the deck ? If not, state where they may also be placed, and the rules to be observed in placing them into position.

No. They may be placed in the binnacle or anywhere near the compass, taking care that the centre of the athwartship magnet is in the fore and aft midship vertical plane, and that the centre of the fore and aft magnet is in the athwartship vertical plane passing through the centre of the compass.

45. Can the compensation of the heeling error be depended upon when the ship changes her latitude. If not state the reason ?

No, because the heeling error varies as the ship changes her latitude, the correcting magnet retaining its permanency.

DESCRIPTION OF THE DEVIASCOPE.

The Deviascope has been invented and produced for the purpose of practically examining candidates at the Board of Trade in Compass Deviation, and for the use of Navigation Schools to practically illustrate the deviation of the compass on board an iron ship, showing how each of the co-efficients is produced, its effect on the compass, and how to compensate and correct the same.

It consists of a large model of a ship's deck, mounted, so that it can be revolved horizontally over a dumb compass card, and also heeled over to port or starboard to any desired angle.

It is fitted with a compass mounted in a brass binnacle or stand, and contains the following fittings as figured on the illustration :—Figs. 3 are two soft iron bars representing the athwartship beams of an iron vessel producing the quadrantal error, or co-efficient D. Another pair of these beams is also supplied, so that a minus D can be produced. Fig. 5 is a

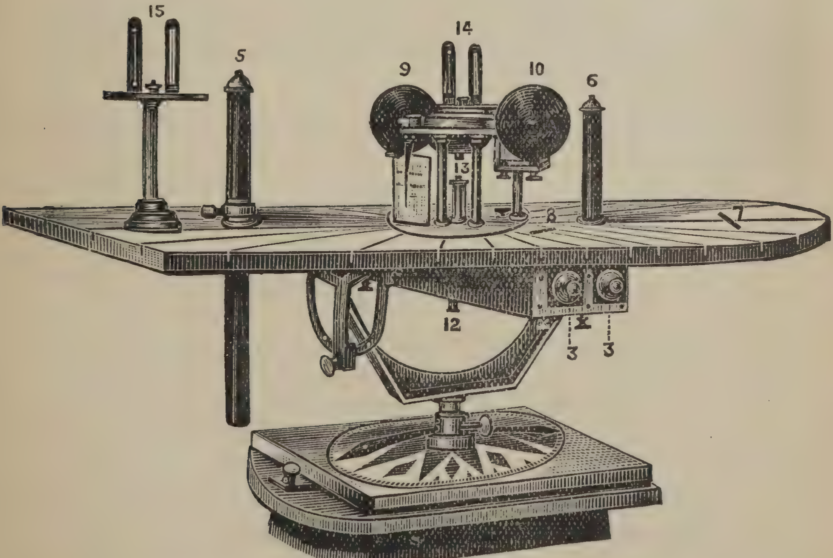


Fig. 96. BEALL'S COMPASS DEVIASCOPE.

vertical soft iron bar representing the stern post or vertical iron of an iron ship and produces the co-efficient B. Fig. 6 is the Flinders bar for compensating this error. The deck of the Deviascope has 32 radial grooves, and the sub-permament magnetism or co-efficients B and C are produced by dropping a pair of bar magnets into the opposite ends of one of these grooves, according to the position it is assumed the ship was in when building. Figs 7 and 8 are the deck magnets for compensating this. Figs. 9 and 10 are the soft iron balls for correcting the quadrantal error ; they can be moved to and from the compass, and the ring which carries them can also be revolved in azimuth to correct minus D. Fig. 12 is a magnet to produce the heeling error ; and Fig. 13 is the small magnet fitted in the binnacle to compensate this. Fig. 14 is the azimuth sights fitted on compass, and Fig. 15 a small Pelorus or dumb card with sights.

A clinometer is fitted on front of the binnacle to show the heel of the model.

COMPASS ADJUSTMENT.

The Tentative Method of Compass Adjustment as generally practised by Compass Adjusters in Ships of the Mercantide Marine.

Before describing the practice, it will be as well to briefly state the co-efficients used to express the different magnetic forces :—

Co-efficient	A	represents	a constant quantiy.
,,	B	,,	semicircular deviation due to fore and aft magnetic forces.
,,	C	,,	semicircular deviation due to transverse magnetic forces.
,,	D	,,	quadrantal deviation due to horizontal induction in soft iron.
,,	E	,,	quadrantal deviation due to horizontal induction in soft iron. unsymmetrically distributed.

Signs and Effects of Co-efficients A, B, C, D, and E.

Co-efficient A represents a constant deviation of the same nature and amount, on all points of the Compass ; + A signifying easterly, and — A westerly deviation.

Co-efficient + B represents an attraction towards the ship's head, and causes easterly deviations with ship's head in the eastern semi-circle of the Compass; and westerly deviations in the western semi-circle, attaining a maximum value on the east and west points, decreasing to zero on north and south points, by Compass.

Co-efficient — B represents an attraction towards the ship's stern, and causes easterly deviations with ship's head in the western semi-circle, and westerly deviations with the ship's head in the eastern semi-circle, with a maximum value on the east and west points, decreasing to zero on the north and south points by Compass.

Co-efficient + C represents an attraction towards the starboard side of the ship, and causes easterly deviations with ship's head in the northern semi-circle, and westerly deviations in the southern semi-circle, attaining a maximum value on the north and south points, decreasing to zero on the east and west points, by Compass.

Co-efficient — C represents an attraction towards the port side of the ship, and causes westerly deviations with ship's head in the northern semi-circle, and easterly in the southern semi-circle, attaining a maximum value on the north and south points decreasing to zero on the east and west points by Compass.

Co-efficient + D gives easterly deviations with ship's head between N. and E., and S. and W.; and westerly deviations between S. and E., and N. and W.

Co-efficient — D gives results exactly the reverse to + D.

Note. Both + D and — D have a maximum value on the four quadrantal points, and become zero on the cardinal points, by Compass.

Co-efficient + E gives easterly deviations with ship's head between N.E. and N.W., and S.E. and S.W.; and Westerly deviations between N.E. and S.E., and N.W. and S.W.

Co-efficient — E gives results exactly the reverse to + E.

Note. Both + E and — E have a maximum value on the cardinal points, and become zero on the four quadrantal points, but are usually very small in amount in Compasses placed in the middle line of the ship.

Heeling Error. The heeling error arises partly from vertical induction in transverse iron, and iron vertical to the ship's deck, and partly from the vertical component of the sub-permanent magnetism of the ship. In the Northern Hemisphere in the majority of cases the N. point of the Compass needle is drawn to windward or the high side of the ship, with, as a rule, a maximum heeling error on N. and S. points, and zero on E. and W. points by Compass. If the Compass is not properly placed in the ship there may be a sensible heeling deviation on E. and W. courses.

TENTATIVE CORRECTIONS.

To correct Co-efficient C. With ship's head north or south magnetic, place a bar magnet (or more than one if necessary) horizontally and exactly athwartship, either on the deck or on any convenient platform, with its centre on the fore and aft line passing through the centre of the Compass card, placing its red or marked end to starboard, if the N. point of the needle deviates to the starboard side, or to port if it deviates to the port side of the ship, moving the magnet to or from the Compass until it points correctly.

> *Note.* The deviation represented by co-efficients C varies inversely as the earth's horizontal force, providing the iron is symmetrically arranged on each side of the Compass.

To correct co-efficient B. With ship's head east or west, magnetic, place a bar magnet (or more than one if necessary) horizontally and exactly parallel to the fore and aft midship line of the ship, either on the deck or on any convenient platform, with its centre on the athwartship line passing through the centre of the Compass, the red or marked end of the magnet being directed aft if the N. point of the Compass needle deviates towards the stern, or forward if it deviates towards the bow, moving the magnet to or from the Compass until it points correctly.

> *Note.* The co-efficient B consists of two parts; one is due to the permanent magnetism of the ship, which varies inversely as the earth's horizontal force; the other to vertical induction in soft iron, which varies as the tangent of the dip. As ships in the Merchant service are rarely built with a view of providing a satisfactory position for the standard Compasses, it is very difficult in many ships to find a position for it where it will not be affected by vertical iron. It

follows, therefore, that if this deviation be compensated as is customary, by a fore and aft permanent magnet instead of by a vertical soft iron bar, the poles of the magnet may in some cases require to be reversed in high southern latitudes.

To correct co-efficient + D. With ship's head on one of the quadrantal points, magnetic, the + D is generally corrected by boxes of small chain, cylinders of soft iron, or soft iron globes, placed athwartships on the same level, and at equal distances, on the port and starboard sides of the Compass, with the centre of their mass on a level with the Compass needle, move them to or from the Compass till the needle points correctly.

To correct co-efficient — D. Co-efficient — D, which is of very rare occurrence, is corrected by placing the above correctors on the fore and aft sides of the Compass.

Note. When once the co-efficient D is properly corrected by soft iron it is corrected for all magnetic latitudes, provided the distribution of the iron in the ship is not materially changed, and provided the magnetism of the soft iron has not been affected by the Compass needles. With short needles having small magnetic power, such, for instance, as Sir Wm. Thomson's, there will probably be no change; but when the needles are long and powerful, one half the original D may be expected to return when approaching the magnetic equator. *See* Admiralty Manual, 1882, page 96, as follows—"When "a compass with long and powerful needles is employed "soft iron correctors placed very near it become magnetised by induction according to the power of the "needles, and the resulting correction will not remain "strictly perfect in all latitudes."

To correct heeling Error. The heeling error is corrected for any given magnetic latitude by placing a vertical magnet exactly under the centre of the Compass card, with its N, or red pole uppermost if the heeling error is to windward or to the high side of the ship, or its S, or blue end uppermost if to leeward or to the low side of the ship, moving the magnet to or from the Compass until the heeling error is corrected.

Note. The heeling error due to the permanent part of the magnetism varies inversely as the earth's horizontal force, and consequently is greatest in high latitudes, diminishes as the ship approaches the magnetic equator, and increases again, still retaining the same name, as the ship recedes from the magnetic equator, in the Southern Hemisphere. The heeling error due to transverse and vertical soft iron decreases as the ship approaches the magnetic equator, where it is zero, and is of a contrary name in the Southern Hemisphere. It is probable that the poles of the vertical magnet may require to be reversed in high Southern latitudes.

A divided scale should be marked or fitted outside the tube or some other convenient place, so as to show the proper position for the correcting magnet as found in any given magnetic latitude, and the same recorded as a guide for approximately placing the magnet in position on any subsequent voyage in the same locality, and especially on the return of the ship to the United Kingdom.

Candidates should understand that the object of tentative adjustment is to bring the deviations within manageable limits, and also to equalise the directive force of the needle so far as is practicable on all courses; but no system of adjustment whatever is sufficiently reliable in character to absolve the navigator from the necessity of using every precaution, and especially of ascertaining the deviation on every available opportunity by observations of the sun by day, and the other heavenly bodies by night.

CHART (ADDITIONAL FOR MASTERS.)

To be answered in writing.

6. What do you understand the small numbers to indicate that you see placed about the chart, and at what time of tide?

The depth of water in fathoms unless otherwise stated at low water ordinary spring tides.

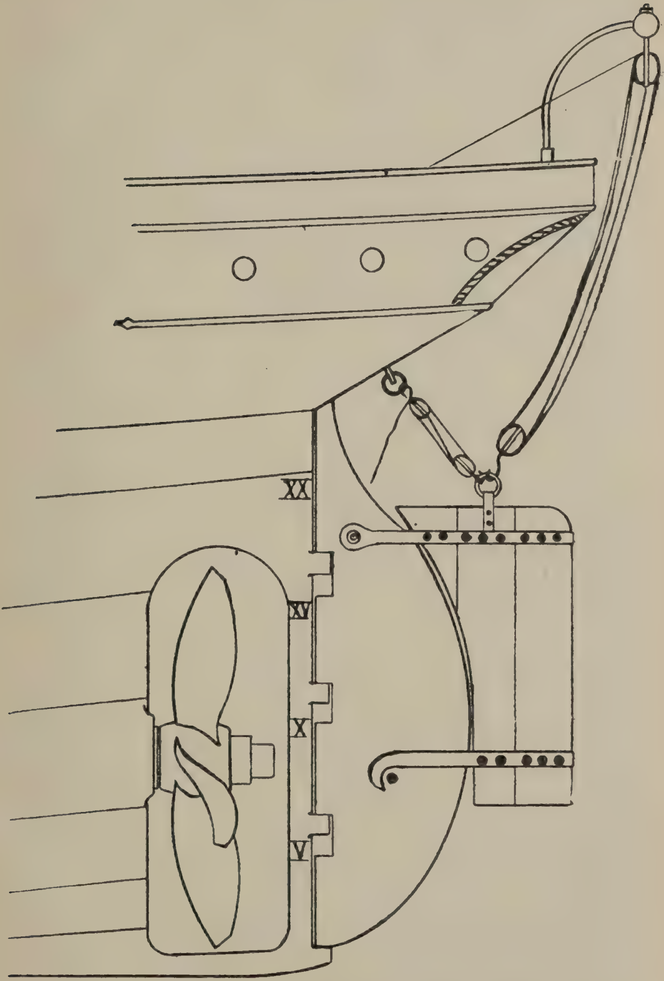
7. What do the Roman numerals indicate that are occasionally seen on the charts near the coast and in the harbours?

The time of high water at full and change of the moon.

8. How would you find approximately, the time of high water at any place, the Admiralty tables not being at hand, nor any other special tables available?

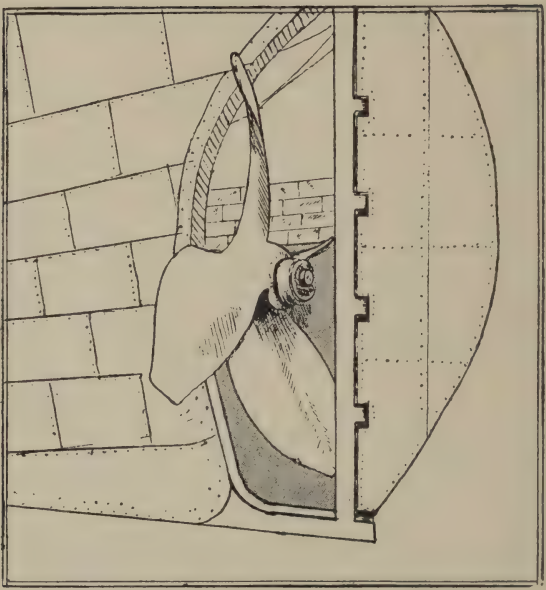
Add 49 minutes for every day elapsed since full and change of the moon, the sun will give the P.M. tide approximately for the day.

Fig. 97.



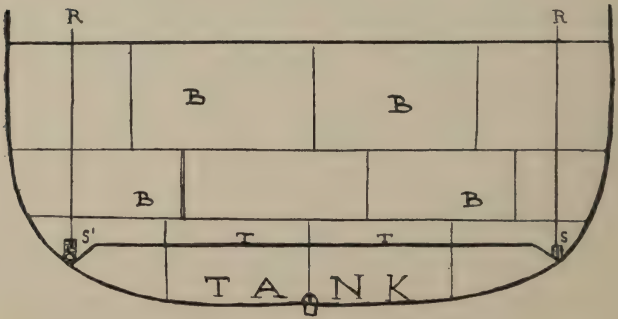
AUXILIARY RUDDER FOR RIVER DANUBE.
(DANUBE RUDDER.)

Fig. 98.



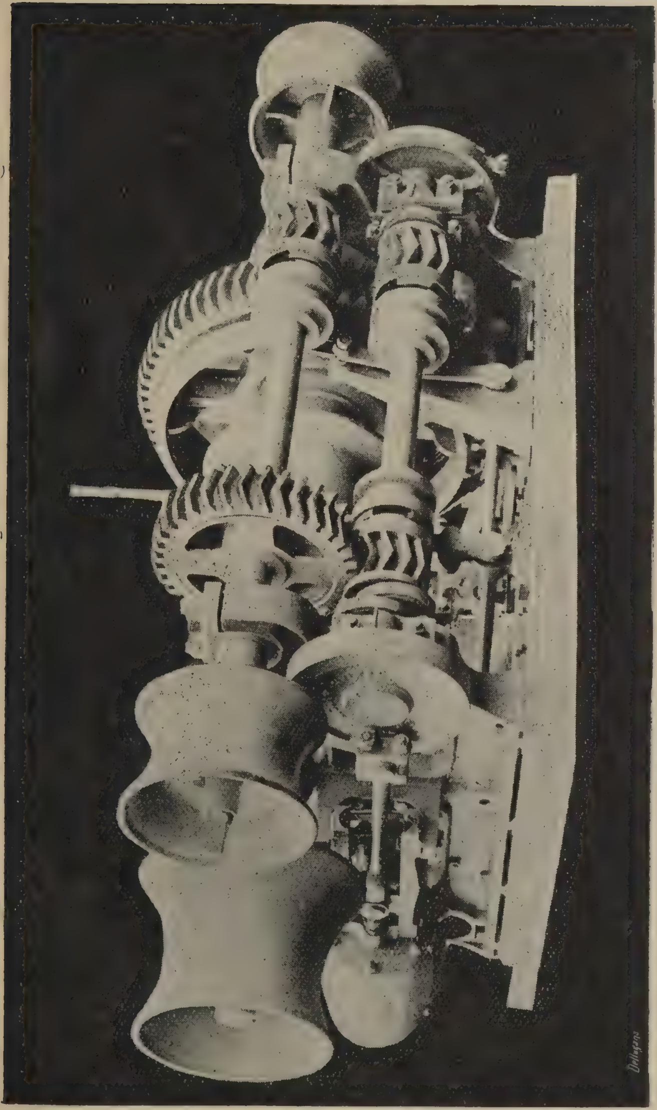
RUDDER AND PROPELLER.

Fig. 99.



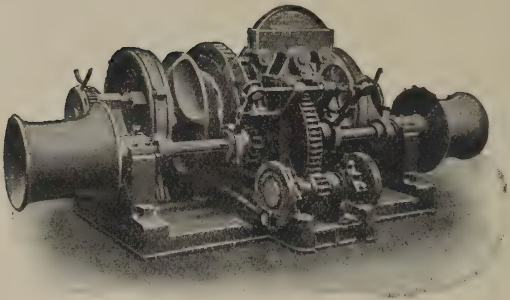
S', SLUICE OPEN. (See page 108.

Fig. 100.



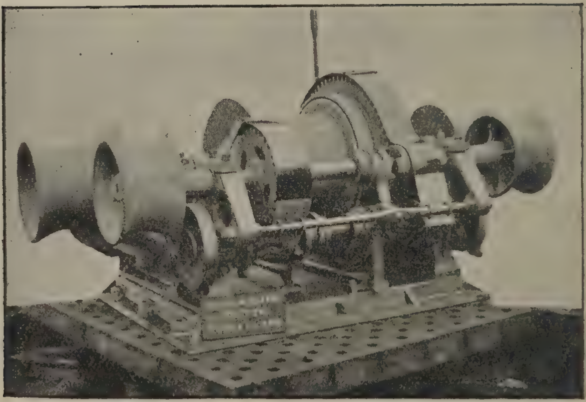
STEAM WINCH.

Fig. 101.



STEAM WINDLASS.

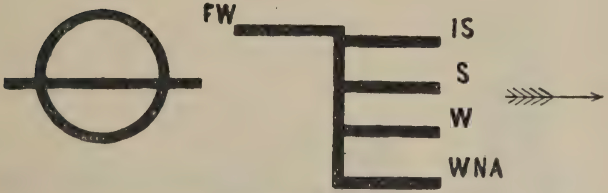
Fig. 102.



STEAM WINCH.

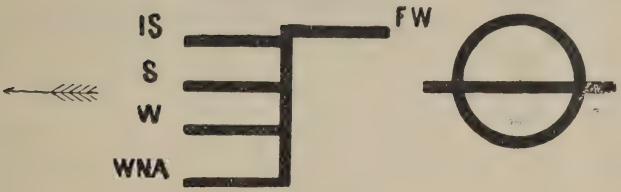
LOAD LINE MARKS FOR STEAMSHIPS.

Fig. 103.



Starboard Side.

Fig. 104.

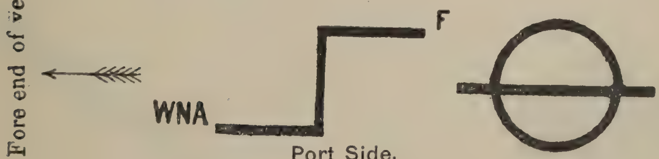


Port Side.

FW—Fresh Water. IS—Indian Summer. WNA—Winter North Atlantic.
S—Summer. W—Winter.

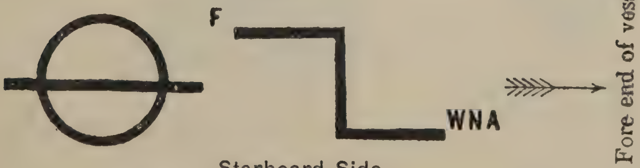
LOAD LINE MARKS FOR SAILING VESSELS.

Fig. 105.



Port Side.

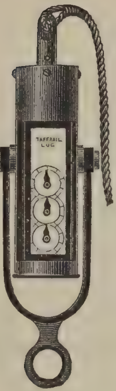
Fig. 106.



Starboard Side.

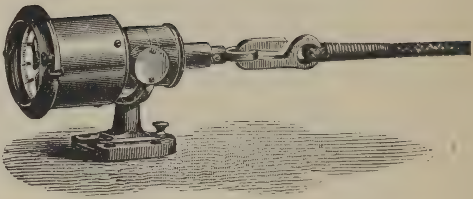
F—Fresh Water Mark. WNA—Winter North Atlantic.

Fig. 107.



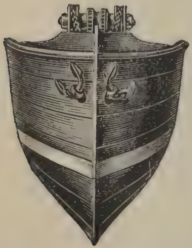
BLISS PATENT LOG.

Fig. 108.



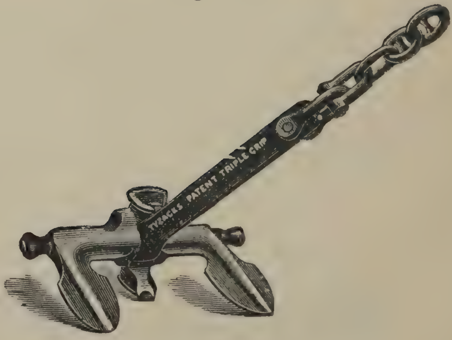
WALKER'S PATENT LOG.

Fig. 110.



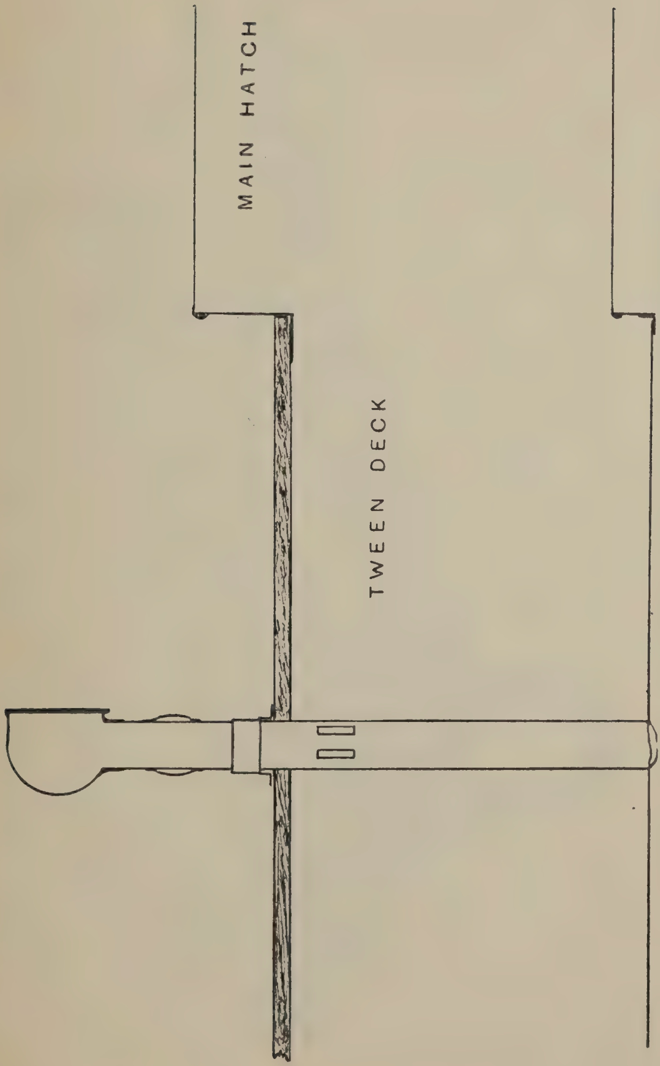
ANCHORS STOWED IN HAWSE PIPES.

Fig. 109.



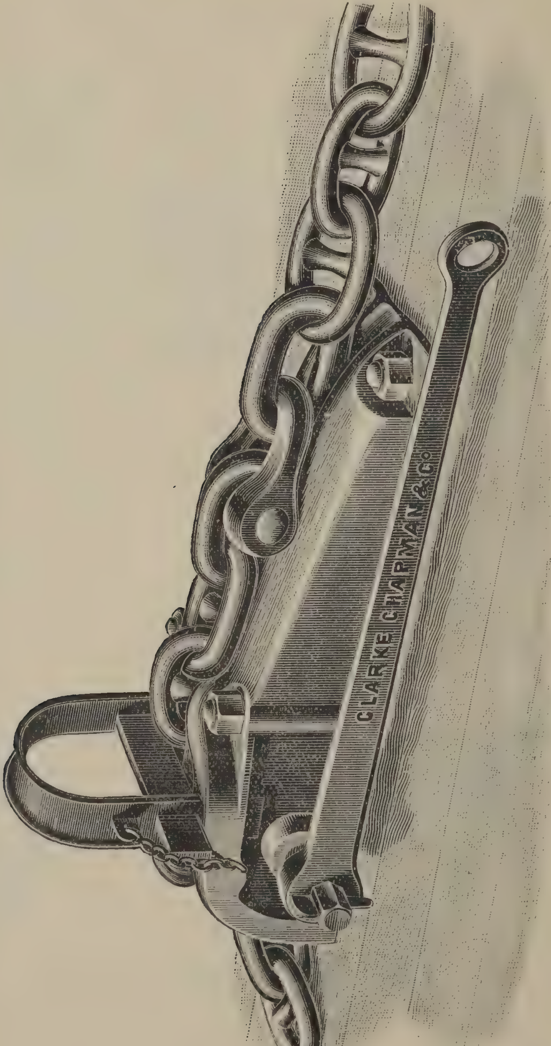
PATENT ANCHOR. (See p. 15.)

Fig. 111.

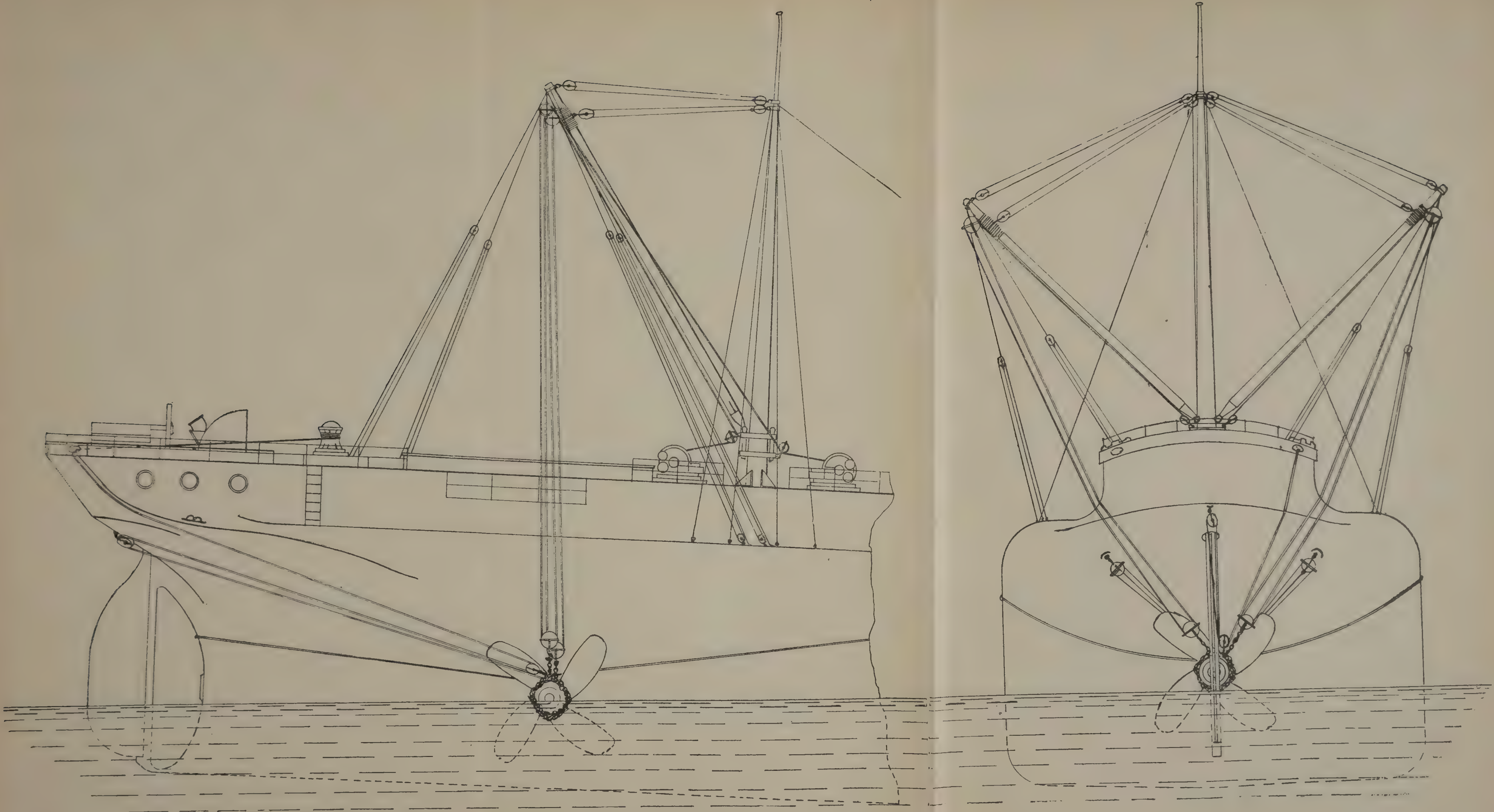


VENTILATOR SHOWING AIR HOLES IN 'TWEEN DECKS.

Fig. 112.



BOW STOPPER.



[To face p. 268]

Fig. 113. HOW A SPARE PROPELLER WAS SHIPPED IN THE PACIFIC OCEAN.

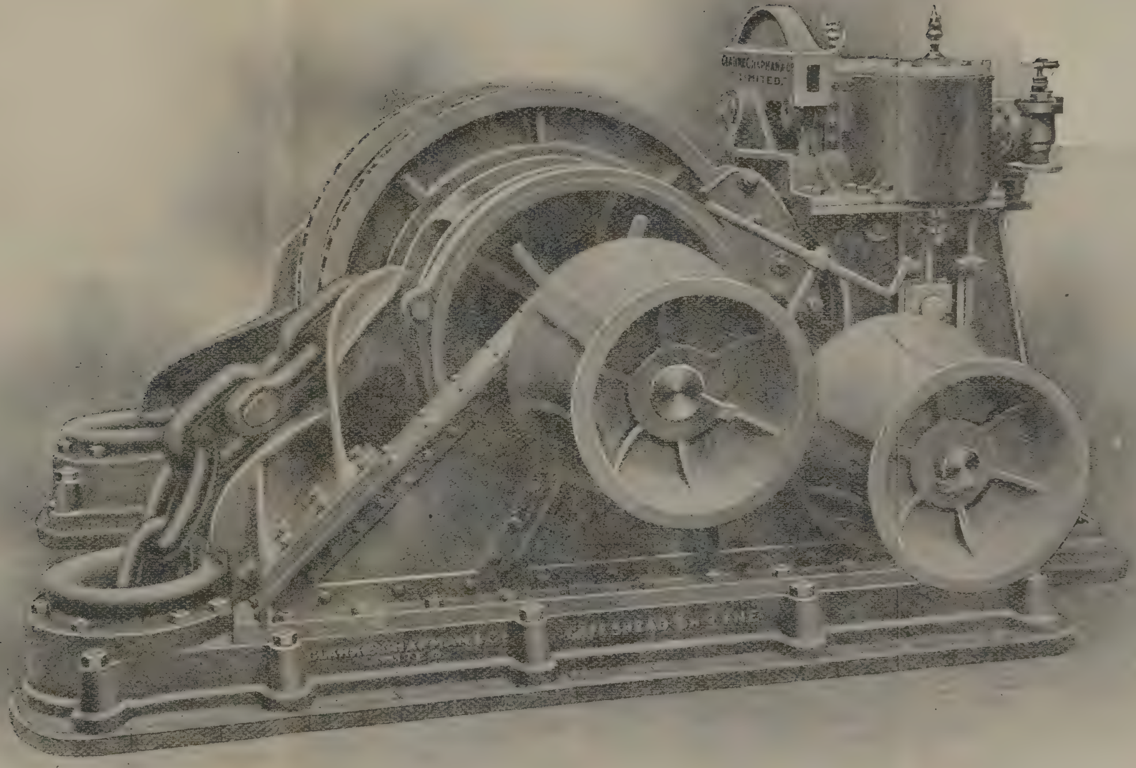
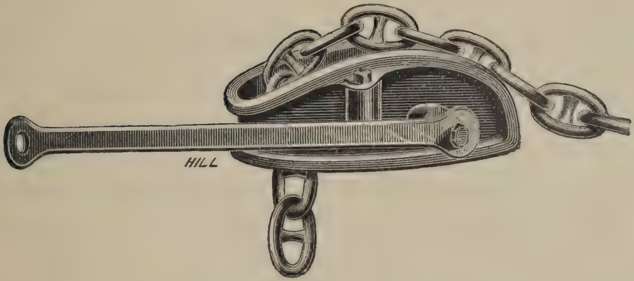


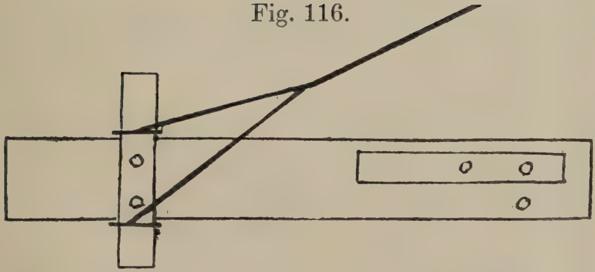
Fig. 114. STEAM WINDLASS WITH PATENT GRIP AND IMPROVED BRAKE GEAR.

Fig. 115.



CHAIN PIPE STOPPER.

Fig. 116.



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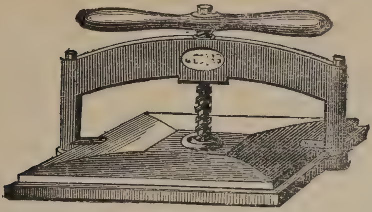

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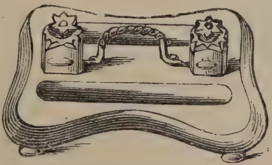

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Vessel built to "Three Deck" Rules, having two decks laid and three tiers of Beams, a Topgallant Forecastle, long Bridge and Poop, double bottom fore and aft.
Turret-deck Steamer (Messrs Doxford's Patent) having 'Tween Decks laid, and deep Framing without Hold beams, Joggle plating.
Trunk Steamer (Messrs Ropner's Patent) having Poop, Bridge and Forecastle, Double Bottom, and deep Framing.
Trunk Deck Vessel (Messrs Hok & Laing's Patent) having Forecastle, Bridge and Poop Decks and deep Frames, without Hold Beams.
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Half Section through Hatchways of a Spar-decked Type of Vessel, having Forecastle, Bridge and Poop Decks, Cellular and double-bottom and Web Frames, two decks laid.
Half Section of Turret Deck Vessel, (Doxford's Patent), having a double bottom with continuous Floors and Hold Beams, and Joggle Plating.
Half Section of a Trunk Deck Vessel (Hok & Laing's Patent) having a double bottom with continuous Floors, Web Frames, and Joggle Plating.
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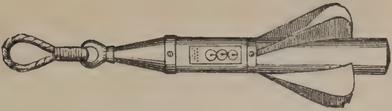

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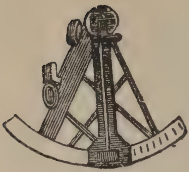

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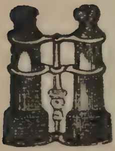

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